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THE UNIVERSITY OF HONG KONG

A MACROECONOMIC STUDY OF THE MAJOR DETERMINANTS OF RETAIL RENTS IN HONG KONG

A DISSERTATION SUBMITTED TO
THE FACULTY OF ARCHITECTURE
IN CANDIDACY FOR THE DEGREE OF
BACHELOR OF SCIENCE IN SURVEYING

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY
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HONG KONG
APRIL 2004

Declaration

I declare that this dissertation represents my own work, except where due acknowledgment is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

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Date: 15 APRIL 2004

Abstract

Despite the importance of the retail market in Hong Kong's local economy, macroeconomic analysis of retail rent is under-researched. This study aims to investigate the major determinants of retail rents in Hong Kong using linear regression technique and empirical data over the period 1992-2002.

The analysis is modelled on the demand-supply interaction in the retail rental market. In light of the close interrelationship between the retail property market and the macroeconomy, macro-market variables reflecting broad trends of the economy and the local retail market are identified. A retail rent model capturing both demand-side and supply-side influences is constructed. The empirical result suggests that six demand-side variables, with different time lags, are significant in explaining the average retail rent fluctuations. Among them, Retail Sales, Inflation and Stock Market Performance have positive influences on the average retail rent; while Mortgage Rate, Unemployment and Departure have negative influences. On the other hand, the effect of the supply-side factor is shown to be insignificant. While recognizing the major determinants, their influences on retail rents are analyzed with specific reference to the local context of Hong Kong. This study is hoped to provide useful insights for market practitioners including developers, investors, landlords and retailers in making decisions in the local retail property market.

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CHAPTER 1 INTRODUCTION

1.1 Background

The retail industry of Hong Kong plays an indispensable role in the territory's economy. In 2002, Hong Kong's retail market generated a total retail sales of HK$176,859 millions, which contributed to approximately 13.4 per cent of the total Gross Domestic Product (GDP)[1]. In the same year, there were about 49,000 establishments in the retail industry, which employed some 130,000 people.[2] For many years, Hong Kong has been a world-renowned "Shopping Paradise". There are numerous retail outlets, either individual stores or multi-store shopping centres, selling a wide variety of goods and services to customers. This attracts a considerable number of visitors[3], who spend about 50 per cent of their expenditures on shopping.[4]

The retail structure of Hong Kong is characterized by the heavy concentration of retail activity in the urban retail cores. Central, Causeway Bay, Tsim Sha Tsui and Mong Kok are the four major retail cores, which have high pedestrian flows and

[1] The GDP of Hong Kong in 2002 was HK$1,323,650 millions, which was a provisional figure and subject to revision later on. Thus, the calculated percentage contribution of total retail sales value to GDP is also provisional figure and it gives an approximate estimation only. Source: Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[2] Source: Census and Statistics Department. (2003 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[3] In 2002, there were a total of about 16.6 million incoming visitors. Source: Census and Statistics Department. (2003c). *Hong Kong Monthly Digest of Statistics, Dec 2003*. Hong Kong: Census and Statistics Department.

[4] Source: Hong Kong Tourist Association. (2003). *Tourism in Hong Kong – The Figures, 2003*. Hong Kong: Hong Kong Tourist Association.

convenient transport networks. (Simmons and Chau, 1991) The high intensity of retail activities leads to high retail prices and rents, especially in these retail cores. In 2002 Q4 (the 4th quarter), the average monthly retail rent was HK$809 per square meter.[5]

In general, the retail market performance is determined by a number of socio-economic factors. There are influences at the microeconomic level. For example, changing demographic characteristics like income, age and number of households in the trade area, all affect the overall expenditure pattern in the local retail market. Changing trends in lifestyle and mobility of people may also affect the demand for retail goods and services. On the other hand, some market factors exert their influences at the macroeconomic level. This can be illustrated by the slackened economy in recent years. In view of the unfavorable market conditions, e.g. soaring unemployment rates, high deflation and dramatic drop of wage levels, people's confidence was undermined and they adopt cautious attitude on spending. This leads to sluggish demand for retail goods and services. Upon the heavy setback in retail business, the retail property market similarly faltered and the average rents were under tremendous downward pressure.[6]

Regardless of the significance of the retail industry and its close relationship with

[5] In 2002 Q4, the average monthly rents in Hong Kong, Kowloon and New Territories were HK$796/m^2, HK$943/m^2 and HK$688/m^2 respectively. Source: Rating and Valuation Department. (2003a). *Hong Kong Property Review – Monthly Supplement Oct 2003*. Hong Kong: Rating and Valuation Department.

[6] Rentals of retail space on average fell by 15% during 1998. Source: Rating and Valuation Department (1999). *Hong Kong Property Review 1999*. Hong Kong: Rating and Valuation Department.

the economy, there has been little research on the local rental market of retail space in Hong Kong. Efforts of empirical studies on local property market are mainly devoted to the residential property sector. While many theories of retail rent determination and econometric analyses of retail market have emerged in the United Kingdom, Europe and the United States, similar work in Hong Kong is relatively scarce. To date, the majority of the macroeconomic studies in Hong Kong generally focus on the modelling of prices of all types of property, or specifically on the residential property prices or office rents. For retail rent analyses, much emphasis is placed on the microeconomic study of demographic factors and physical attributes of the retail space. To the best of the author's knowledge, there is no comprehensive research conducted in Hong Kong on the relationship between macroeconomic factors and retail rents at an aggregate level.

In attempt to further advance the limited literature in Hong Kong, this study is devoted to an empirical investigation of the major determinants of retail rents from a macroeconomic perspective. It is expected to provide a framework for understanding the local retail rental market and to give useful insights for market practitioners such as developers, investors, landlords and retailers in making various decisions in the retail property market.

1.2 Objectives

This study has three objectives:

- To examine the general relationship between various macro-market factors and retail rents at an aggregate level.
- To identify the major determinants of retail rents in Hong Kong by constructing a macroeconomic model of retail rents using data over the period 1992-2002.
- To investigate and explain the impacts of the identified determinants on retail rents in Hong Kong.

1.3 Framework

A literature review on the theoretical background of rent determination will be conducted to establish the fundamental underpinnings to this study. The macro-market variables to be tested will be selected based on ideas brought from previous studies and the local situations in Hong Kong. In order to determine and analyze the major macroeconomic determinants of retail rents, multiple regression analysis will be utilized to construct a retail rent model, with the average retail rent as dependent variable, and other selected macro-market factors as independent variables. The model will then be empirically tested using quarterly data over the period 1992-2002. Insignificant factors will be removed from the final model specification by a stepwise

procedure. The regression results will then be analyzed to examine the effects of the significant variables on retail rents. Conclusions on the findings and limitations of the study will be drawn at the end.

This study is divided into six chapters. Chapter 1 is the introduction, which describes the background, objectives and framework of this study.

Chapter 2 will be a review of both local and overseas literature on two aspects, including the theoretical background and previous researches of rent determination. A brief summary of the literature review will also be provided.

Chapter 3 will be an overview of the methodology employed in this study. The multiple regression analysis will be introduced. The general development processes of the retail rent model will also be outlined.

Chapter 4 will provide an overview of the empirical model. It will firstly identify and justify the explanatory variables to be tested. Their expected effects will also be examined. Finally, it will specify the data used for the empirical analysis.

Chapter 5 will present the empirical results and provide a comprehensive analysis of the results. It will also illustrate the implications of the findings.

Chapter 6 will be the concluding chapter. It will summarize the findings and limitations of this study. Further research areas will also be suggested.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

The first step to retail rent modelling is an analysis of the operation of property market, in order to establish the fundamentals for understanding the theoretical principles of rent determination. Previous researches in different property sectors should then be reviewed to identify the approach and common explanatory variables used in rent determination. These steps are important in establishing the framework of this study. They can provide useful insights into the theoretical underpinnings, approaches and explanatory variables for constructing the retail rent model. Section 2.2 will examine the theoretical background of rent determination; Section 2.3 will review the local and overseas studies on rent determination in different property sectors; and Section 2.4 will be a brief summary of findings from the literature review.

2.2 Theoretical Background of Rent Determination

This section attempts to review the general theoretical underpinnings to rent determination in the property market, with particular reference to the retail property sector and the local context of Hong Kong.

2.2.1 Interrelationship between Property and Economy

"Property is an integral part of the nation's economy, and anything which has implication for the economy will have implications for property." (Fraser, 1993 p.1) The overall performance of an economy affects the property market performance. For example, changes in financial climate affect property yields due to varying interest rates and inflation rates. On the other hand, some studies suggest that fluctuations in property market have significant impacts on economic conditions. McWilliams (1992) argues that the lowering of property capital values inhibits firms' capacity to borrow money by mortgages. This leads to lower level of investment, thereby slowing down the economic growth. Fraser (1993) confirms that the property market and the economy are interdependent, such that both of which affect each other. As an illustration, falling interest rates lead to lower cost of obtaining capital and hence encourage investment in the property market. Such an increase in investment in turn leads to an economic upturn

Some previous studies also demonstrate that property cycles are directly tied to local business cycles and macroeconomic cycles. Wheaton (1987) suggests that real estate cycles and national macroeconomic movements are closely linked. Fraser (1993) affirms that property cycle is founded upon political decisions, technical changes and economic events. Case (1992) further suggests that real estate cycle amplifies

business cycles in both upward and downward directions. On the other hand, there are various studies on the lead-lag relationships between property cycles and business cycles. For example, Kondratieff (1951) shows that a property cycle lags behind the turning points of a business boom, but leads a business recession. The author explains that property development takes time to commence during business boom, while property market experiences a sharper decline during business downturn.

Furthermore, property investment is widely recognized as a part of the aggregated investment in the economy. As a result, property is sensitive to fluctuations in the investment market, which are in turn affected by the general economic conditions. All in all, property market plays an important role in the economy and is closely interrelated with macroeconomic influences.

Property and Economy in Hong Kong

Hong Kong's economy is characterized by the absence of arbitrary controls and political interferences. Therefore, it provides an open economy for real estate asset rentals and prices to adjust rapidly and efficiently. However, the real estate adjustment processes are still subject to capital market conditions within an open economy. (Renaud *et al.*, 1997) Tam (2000) points out that the economic profile of Hong Kong, including interest rates, income, inflation and economic integration with China, has a

significant impact on its property market. Tse *et al.* (1998) examine the linkages between the instability of property market and macroeconomic instability since 1960. The result shows that the property cycle in Hong Kong is more volatile than the economy. Moreover, there exists an inherent cyclic interaction between the property market and the economy as a whole. As Hong Kong's economy expands, levels of employment and income increase. They in turn raise the demand for office, retail and residential space for investment, business operations or occupation purposes. Conversely, the recent economic recession experienced in Hong Kong is accompanied by serious depreciation of property assets, rendering them to become negative assets of many property owners. This in turn seriously degrades people's confidence and purchasing power. Therefore, they have lower incentive as well as capital to invest in other assets. Consequently, this leads to a slower growth or even negative growth of the whole economy.

In Hong Kong, the real estate sector has long been regarded as a crucial part of the local economy. In 2002, the real estate sector's share of the Stock Exchange of Hong Kong in terms of market capitalization was approximately 12 per cent.[7] In the same year, the real estate related industries produced a gross output of approximately HK$285.7 billion. There were about 26,000 establishments in the industries, which

[7] Source: Securities and Futures Commission. (2004 website). *Website of the Securities and Futures Commission*. [online] Available from: http://www.hksfc.org.hk/eng/statistics/html/index0.html [Accessed 15-3-2004]

employed an approximate total of 233,000 people.[8] On the other hand, sales of land is a major source of revenue of the Hong Kong Government.

As illustrated, the real estate sector in Hong Kong is a major part of the territory's economy by its sheer size and important contributions to the stock market, employment and the government's revenue. Therefore, a close relationship between the property market and various macroeconomic market factors is expected in the local context of Hong Kong. This instigates the study of the effects of macroeconomic factors on the local property market, particularly the retail property market.

Macroeconomic Studies on Property Market

Property values in different property sectors are determined by the interaction of demand and supply, and these forces are in turn determined by local economic conditions. The cyclical variations of property values are the results of the fluctuating economic cycle. Investment Property Databank and University of Aberdeen (1993) put forward the view that there is a close relationship between the demand for property and key macroeconomic variables e.g. levels of employment, consumer expenditure. This implies the linkage between the property market and the economy.

[8] The figures include Construction; Real estate development, leasing, brokerage and maintenance management; and Architectural, surveying and project engineering. Source: Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

Furthermore, the strength of an economy determines consumer confidence and performance of business activities. They in turn influence the demand for office space by firms or retail space by retailers, etc.

As mentioned that there are important direct or indirect linkages between the property market and economic fluctuations, real estate market researchers should put emphasis on the macroeconomic studies of economic indicators to explain long-run trends and short-run movements of prices or rentals in different property sectors. Macroeconomic studies consider the behaviours of the whole economy at an aggregate level. They deal with aggregate variables that are averages or aggregations of data measured within the market. (Dipasquale and Wheaton, 1996) There is much empirical work on the links between macroeconomy and real estate returns in other countries, for example, Chan *et al.* (1990) in the United States (U.S.), and Brooks and Tsolacos (1999) in the United Kingdom (U.K.). According to Schmitz and Brett (2001), the economic strength of a place can be demonstrated by its macroeconomic conditions, including interest rates, inflation, job security, industrial productivity and stock market stability. Similarly, in a local study of Ervi (2002), the rate of return in the property market is suggested to be sensitive to economic activities; while the rate of demand for space is particularly influenced by fluctuations in employment and local total output. The author also recognizes that macroeconomic variables include

unemployment, inflation rates, GDP, interest rates, balance of payments and foreign exchange rates.

Retail Property vs. Economy

Retail sector is one of the property sectors and its level of rents is also influenced by the economy. Isaac (1998, p.89) regards the retail real estate as "the best performing property sector in the property portfolio". Liow (2000) adds that the value of retail space should reflect the demand–supply conditions in the retail market. Therefore, there is close relationship between retail rental changes and economic fluctuations. As an illustration, a reduction in consumer spending during economic downturn leads to lower demand for retail goods and services. Retailers are thus under pressure to reduce their operating costs, and become less inclined to invest in additional space. Consequently, according to the law of supply and demand, the rental of retail space drops. Jones (1995) confirms this concept by concluding that rental growth is linked to the profitability of business and inflation, and is therefore subject to national economic influences. As a result, the explanatory variables used for retail rent determination must capture the effects of general economic conditions on the demand and supply of retail space.

There are several studies on the relationship between retail real estate and the

aggregate economic activities. Fraser (1993) recognizes that regional shop rents vary with spending power of the local population, which in turn depends upon local economic conditions.

On the other hand, some overseas researches investigate the relationship between retail rents and the economy using macroeconomic models. D'Arcy *et al.* (1997a) postulate that the demand for retail space fluctuates with changes in business conditions. They establish a macroeconomic model, which relates changes in retail rents to changes in a range of demand-side factors that can reflect general economic conditions, e.g. consumer expenditure, GDP, disposable income, unemployment and interest rates. Tsolacos (1995) also agrees that retail rents are sensitive to broad economic forces in both the regional and national contexts. The author suggests that the demand for retail space is derived from the demand for retail products. The demand for retail products is in turn proxied by various economic indicators, including volume of retail sales, disposable income, GDP and total consumer expenditure.

In conclusion, this section shows that there is a close relationship between the real estate market and the general economy. Retail property, as one of the property sectors, also interacts with general economic conditions. Therefore, the study of retail rent determination in this study should take into account of the macroeconomic

influences of the market economy.

2.2.2 Principles of Demand and Supply

According to the law of supply and demand, the setting of price level of a product is determined by the market forces of demand and supply. Similarly, the price or rental levels of property are also determined by the demand-supply interaction. This idea is supported by many scholars such as Giussani *et al.* (1992), Fraser (1993), Key *et al. (1994b),* Tsolacos (1995), D'Arcy *et al.* (1997a, 1997b), Tay *et al.* (1997), Chaplin (2000), and Hui and Lui (2002). In particular, Fraser (1993) and Key *et al.* (1994b) agree that rental and capital values are heavily influenced by the forces of demand and supply in each sub-market, and these forces are in turn subject to the fluctuations of local economic conditions.

As a result, it is traditional to model rent determination using indicators of demand and supply in the equations, in order to capture local forces that underpin broad trends in the rental markets. Key *et al.* (1994b) introduce the "fundamentalist" approach to property market analysis, which explains rents in terms of macroeconomic demand and supply indicators. They recognize two conceptual parameters in their theory of rent determination: the "demand-side (or surplus) concept", which regards rent as a super-normal profit; and the "supply-side concept",

which regards rent as an annualized development cost. They suggest that the determination of a property's rental value is based on both of these concepts.

Accordingly, as in one of the property sectors, retail rents at aggregate level are expected to respond to both aggregate demand and supply conditions in the retail market. (Tsolacos, 1995) With reference to D'Arcy *et al.* (1997a), there are two main theoretical approaches to specify models of retail rent determination, namely the "**demand-supply interaction"** and the "**surplus theory"**. These two theoretical approaches are reviewed in the following sections.

a) Demand-Supply Interaction

As mentioned, retail rent is subject to the forces of demand and supply of retail space in the local market at an aggregate level. These forces are studied separately in details in the following parts.

Demand

The nature of retail property is twofold, i.e. it acts as both a factor of investment and a factor of production. If a retail space is bought and then owned for letting purpose or sold for earning profits, it acts as a factor of investment. Then the demand for retail space by investors i.e. investment demand, is based on their expectations on it to

generate profits or appreciate in capital values. However, since this study is concerned with the rental of retail space instead of its capital price, the ownership of retail space for investment is not the area of interest. Conversely, we put emphasis on the demand for retail property as a factor of production i.e. occupation demand. Fraser (1993) distinguishes the effects of these two types of demand: investment demand determines price and yield; while occupation demand determines rental value.

Principle of Derived Demand

According to Fraser (1993 p.184), derived demand means that the demand for a factor is derived from the demand for the products of the factor. Retail property is a business property, which provides space for retailers to conduct business with customers. From occupiers' point of view, it is a factor of production for the retail business. The aggregate demand for retail property in a market is indeed derived from the demand for retail goods and services. Consequently, retail rental values must be influenced by the demand for goods and services. Thus, in investigating the occupation demand for retail space, emphasis should be placed on the demand for retail goods and services.

On the other hand, it is shown in many previous studies that the demand for retail products is generally determined by customers' purchasing power, which in turn depends on the aggregate economic conditions of the place. Tsolacos (1995) justifies

that the demand for retail space is determined by the demand for retail services, which in turn relate positively to economic trends. Fraser (1993) further suggests that the demand for goods and services is dependent on household income, particularly real disposable income. Consequently, the demand for retail space fluctuates with changes in economic conditions. A higher demand reflects buoyant economic conditions with expansion of existing retailers and new establishments of retail business. In conclusion, the retail space demand and subsequently its rental levels are determined by variables that can proxy economic conditions. Examples of these demand-side macroeconomic variables include GDP, total consumer expenditure, disposable income, volume of retail sales and profitability of retailers.

Supply

Supply of retail space consists of both the existing stock available for relet and the newly constructed retail space for first-time letting. Fraser (1993) points out that an increase in the supply of existing stock for relet is due to increased number of tenants who have recently decided to vacate their premises. The lower occupation demand is the result of lower expectation on their business profitability. Conversely, as profitability of retail business increases, the occupation demand for retail space increases, and the supply of existing stock will fall.

On the other hand, the supply of new retail space increases with an increased aggregate demand, but subject to a time delay. The final decision to construct is based on the positive development profit, which is the difference between the completed property value and the development cost. Therefore, an increase in rental and capital values of retail property tends to increase its new supply.

As the supply of retail space is related to its demand, which is shown to be related to economic conditions, the supply is also affected by macro-market conditions. This is supported by the argument of Ervi (2002) that the demand-side of property market is linked directly to the economy, while the supply-side link is indirect. As mentioned by Schmitz and Brett (2001), the key indicators of supply-side factors include size of current stock, current vacancy rate and anticipated near-term new construction. In brief, attention should also be devoted to macro-market conditions in considering the supply of retail space.

According to the law of supply and demand, the determination of retail rents is subject to the joint forces of both demand and supply. A number of studies, for example, Tsolacos (1995) and Chaplin (2000) have included both demand-side and supply-side factors in their models. The studies either utilize total retail stock or new retail building output to capture the supply-side effects on retail rents.

However, some researchers protest that supply-side factors have insignificant

effects on retail rent determination, for example, Hetherington (1988). The insignificance of supply-side influences can be the result of supply inelasticity of retail space in the short run.

For retail real estate, the supply of new space tends to be inelastic i.e. fixed in the short run. This means that the new supply only increases after a time lag in response to an increase in the demand for retail space. The time delay is possibly resulted from the inability of developers to instantly recognize the increased demand; institutional factors such as restrictive planning policies, lack of land supply and complicated statutory approval procedures; high capital requirement for development; and long design and construction time involved. Therefore, the equilibrium retail rent ultimately depends on demand in the short run. Fraser (1993), Key *et al.* (1994b) and D'Arcy *et al.* (1997a) all assert that the supply of different types of property tends to be inelastic, and therefore rental values are primarily demand-determined. Moreover, D'Arcy *et al.* (1997a) further introduce the concept of **rent surplus theory,** which assigns less significance to the supply-side influences on retail rent adjustments. Nevertheless, they suggest that the inclusion of supply-side variables in the retail rent model, though may not be significant, is obviously desirable.

b) Rent Surplus Theory

Fraser (1993) puts forward the surplus concept of rent. The author argues that retailers often assess the maximum rents they can afford to pay by deducting the expected fixed and variable costs from the expected revenue i.e. based on their surplus or turnover. On the other hand, the expected revenue depends on the aggregate demand for their products, which affect both the sales volume and price levels of the retail products. Therefore, retail rent is indirectly determined by the demand for retail goods and services. Fraser (1993) adds that landlords rarely have power to raise rents autonomously as rents are determined by the mechanism of the surplus theory.

The rent surplus theory is essentially a demand-side theory. It explains the mechanism for determination of the maximum rents that retailers can afford to pay. Fraser (1993) suggests that the theory is particularly relevant to retail space because the supply of which tends to be inelastic in the short run. Therefore, retail rent is primarily demand-driven. This conforms to the mechanism of the surplus theory that the maximum rents are determined by the turnover of the retail business, which in turn depends on the aggregate demand for retail goods and services.

As a result, the rent surplus theory assigns less significance to the supply-side influences in retail rent determination. (D'Arcy *et al.*, 1997a) Robertson and Jones (1998) hypothesize that the prime retail rents at local level are primarily determined

by demand-side variables. In the retail rent model of D'Arcy *et al.* (1997a), only demand-side economic variables e.g. GDP, unemployment, interest rates, disposable incomes, consumer expenditure, are included to capture retail turnover.

However, since the surplus theory does not take explicit account of the supply-side influences, it cannot provide a comprehensive explanation of rent determination based on the demand-supply interaction. Furthermore, it can only determine the maximum rent that retailers can afford to pay, but fail to explain the market rents. As a result, the demand-supply interaction is a better approach to be used in this study for the analysis of retail rents.

In conclusion, it is shown that retail rent is a function of demand and supply, in which demand is a key variable. This study confines its interest to the demand for, and supply of, retail space for occupation rather than investment. Moreover, it has been reviewed that both demand and supply factors are sensitive to changes in the overall macroeconomy. Therefore, this study is modelled on the demand-supply framework with the incorporation of macro-market variables. However, there are some hurdles in this study based on the demand-supply interaction. There are difficulties in the selection and measurement of variables to proxy the demand and supply influences. Therefore, a thorough literature review of similar studies is needed to provide important insights for this study.

2.3 Review of Research on Rent Determination

This section reviews both local and foreign macroeconomic studies in residential property market, commercial property market, office market and retail property market. Most researchers employ a wide range of variables to proxy demand and supply influences of macro-market factors in the respective property sectors. Compared with other property sectors, macroeconomic determination of rents in the retail property sector is under-investigated, especially in the local market of Hong Kong. Nevertheless, similar researches in other market sectors are also reviewed as they can provide significant insights for establishing the fundamentals of this study, including structures of analysis and selection of explanatory variables.

Modelling of Residential Property Market

There are numerous econometric studies on overseas and local residential property markets at the macroeconomic level.

Cotter and Hoesli (1994) study the probability of selling a residential unit in the U.S. using macroeconomic variables, including **inflation rate**, **mortgage interest rate**, **economic activity** (measured by **consumer spending**, **business incorporations, factory utilization rate** and **personal savings rate**) and **unemployment rate**. The result of their regression model shows that the number of business incorporations,

which implies the level of business activity, has a positive impact on the average sales rate of homes. Conversely, the sales rate is negatively influenced by the unemployment rate and consumer spending, indicating a trade-off between consumer spending and investment in housing. On the other hand, the mortgage rate has a positive but insignificant correlation with the sales rate.

In another study by Harris (1989), explanatory variables including **income per household**, **consumer price index less shelter costs**, **occupied and vacant housing stock**, and **mortgage interest rates**, are incorporated into the regression model to investigate the relative effects of nominal and real interest rates, both of which are shown to have negative effects on the real housing prices.

There are several studies on residential property prices in Hong Kong. Wong (1995) regresses residential property prices on **supply of residential property**; demand-side factors which are proxied by **interest rate** and **income**; and demographic factors including **numbers of domestic households**, **marriages**, **age/sex and age/earning ratios**. He recognizes that the demand-side and demographic factors are the major short-run determinants of residential prices in Hong Kong. On the other hand, Hui and Lui (2002) use an econometric approach to examine the relationship between the real and rationally expected housing prices in Hong Kong over its boom and bust cycles. They suggest that the private housing

prices are co-integrated with market fundamentals. This may explain the common use of variables that proxy economic conditions in both local and foreign studies on residential price determination.

Commercial Rent Determination

On the other hand, efforts have been contributed by many foreign studies in developing rent models of commercial property in general, comprising of offices, retail space and industrial space.

Key *et al.* (1994) examine several rent models for retail, office and industrial market sectors in the U.K. from the early 1960s to 1992. Their models include lagged real rents; supply-side proxies i.e. **stock of floor space**, **new construction level;** demand-side proxies i.e. **consumer spending** and **GDP**; and general economic variables i.e. **interest rates** and **inflation rates**. The results confirm that the simple demand-supply interaction is the key driver of rental cycles. There are strong influences of demand-side changes, which are themselves driven by general economic cycles, and strong negative influences of supply-side proxies in their respective market sectors. With respect to the retail sector, it is shown that higher interest rates depress rental levels since they place financial constraints against the expansion plans of retailers. The rate of inflation and the volume of consumer spending have negative

and positive effects on the current retail rents respectively. For the supply-side factors, the total stock of space and the volume of new construction two years ago depress the current retail rental levels, indicating that new supply pushes down rental values after a construction lag.

Dobson and Goddard (1992) develop a theoretical model of price and rent determination in the commercial property market of four regions in Britain over the period 1972-1987. They study the effects of macroeconomic variables, including changes in **employment**, **real interest rate** and **real residential property prices** on real prices and rents of offices, retail space and industrial space. The authors demonstrate that the prices and rents are sensitive to residential prices, indicating that the commercial property market is sensitive to the performance of the residential property market. Real interest rate is found to have strong positive effect on rents, particularly on retail rents. On the other hand, employment has important influence on their prices and the rent for industrial property in particular.

Office Rent Determination

With respect to individual commercial property sectors, published researches concentrate largely on the office sector. The retail and industrial sectors have generally attracted less attention. In respect of the office sector, existing local and

overseas researches produce a variety of econometric models to investigate the effects of macroeconomic variables on office rents. It is noted that many of these models have also been used to generate rental forecasts.

Various researches have been carried out for the office markets in North American. For example, Hekman (1985) suggests that office rents adjust in response to local and national economic conditions. He develops an office rent model based on the demand-supply interaction. He specifies the average office rent as a function of **real Gross National Product (GNP)**, **total local employment**, **local unemployment rate** and **vacancy rate of existing buildings** using data from fourteen cities in the U.S. over the period 1979-1983. The estimated model shows that office rent increase with GNP at a much faster rate in large cities compared to small cities, but are inversely correlated to the current vacancy rate.

There are also various researches on office rents for the European markets. In the study of Gardiner and Henneberry (1988), they take into account of a supply-side variable, namely the **regional office floor space**, in addition to the demand-side variables, including **GDP**, **unemployment**, **average incomes** and **service sector employment**. Their final cross-sectional model postulates a correlation of the regional office rent index with regional GDP lagged two years and contemporaneous office floor space.

Comparative studies of office rent determination have also been conducted in Europe. Giussani *et al.* (1992) investigate the relationship between changes in office rents and the demand-side variables that capture fluctuations of economic activities in ten European cities over the period 1983-1991. The authors suggest that **real GDP**, **unemployment rate**, **employment in service sector** and **real long-term interest rates** are likely to affect real office rents. The analysis shows that the European office rentals are determined particularly by real GDP and unemployment rates. A simpler model of office rent determination has been constructed by Fraser (1993) to investigate the effects of economic conditions on office rents in the U.K. In his study, a positive cyclical relationship is found between **GDP** and office rents in fifteen major office centres in the U.K.

D'Arcy *et al.* (1997b) examine the influences of broad economic trends and market size on the movements of real office rents among twenty-two European cities over the period 1982-1994. The authors construct a time-series cross-sectional model using several measures of economic growth, including changes in **real GDP**, **real interest rates** and **service sector employment**; and a measure of market size i.e. **office stock** in different cities. The results demonstrate the significance of real GDP and real interest rates in explaining the European real office rental movements, but the market size appears to have insignificant impact. Likewise, D'Arcy *et al.* (1999)

examine the lagged and contemporaneous effects of both demand and supply proxies on the effective office rents in a small European market of Dublin over the period 1970-1997. Their single-equation model is also based on the supply-demand interaction with inclusion of **volume of new office construction completions**, **GDP** and **service sector employment** as explanatory variables. The empirical results indicate that GDP lagged one year and new office completions lagged three years are statistically significant and correctly signed. However, the service sector employment is not significant and is eventually excluded from their final model.

On the other hand, there are also macroeconomic studies of office rents in Hong Kong. For example, Ng (1998) analyses the effects of **inflation**, **interest rates** and **vacancy rates** on the rental adjustment process over the period 1980-1996. Results of the analysis show that the real rental changes response negatively to the deviations of actual vacancy rate and natural vacancy rate.

Retail Rent Determination

In the history of modelling of retail property markets, much effort has been devoted to the developments of spatial interaction and gravity models. Examples include Kivell and Shaw (1980), and Ghosh (1986). With respect to retail rent analysis, many studies in Hong Kong and other foreign places only emphasize on the microeconomic

perspective and only target on shopping centre space. Examples include Tay *et al.* (1999) in Hong Kong; Guidry and Sirmans (1993), Hardin III and Wolverton (2000) in the U.S; and Gerbich (1998) in the New Zealand. They focus on the study of demographic factors e.g. household income, age, sex in the trade areas; and physical attributes of the retail space e.g. location, architectural design.

On the other hand, there is no comprehensive local research on the relationship between macroeconomic factors and retail rents at an aggregate level. Nevertheless, a number of overseas studies have been carried out to examine various localized or national macroeconomic determinants of retail rents. Their models and results are reviewed and expected to provide valuable insights into the selection of explanatory variables and approach of investigation of this study.

Various overseas studies model retail rents using demand-side variables at the macroeconomic level. Hetherington (1988) studies the determinants of retail rents in the U.K. using regression models that incorporate demand-side variables, namely **retail sales** and **retail profits** adjusted for inflation. Supply-side variables are not included as they have insignificant statistical relationship with retail rents. The analysis shows that retail sales volume is the most significant determinant of the retail rents in the U.K. It is because higher retail sales encourage retailers to expand their business and new players to enter the market, thereby increasing the demand for retail

space and hence its rents. The author further shows that the retail rents are closely correlated with the **volume of overseas visitors** in London.

Hillier Parker (1984, 1985, 1987 cited Tsolacos, 1995, p.520) suggests that retail rent can be determined and forecasted by demand-side proxies, including **real retail profits, real disposable income and retail sales volume.**

D'Arcy *et al.* (1997a) develop an econometric model of demand-side variables for retail rent determination in five major European cities over the period of 1980-1994. The authors construct their model based on the concept of rent surplus theory as explained before. They suggest that retailers assess the rents they can afford by deducting operating costs from their revenues. Therefore, their turnover is an important rent determinant. They further propose several economic variables that can be used to capture the retail turnover, including retail profits, consumer expenditure, retail sales, GDP, disposable income, unemployment and interest rates.

The authors deploy a time-series cross-sectional methodology to test the important retail rent determinants across the five cities. The change in real retail rent is regressed on the changes in **real consumer expenditure, real value of retail sales** and **GDP** with lag effects. The authors assume that these demand-side variables will influence retail rents within a period of up to three years, which is suggested to be a sufficient time horizon for rentals to adjust in response to changes in macroeconomic

circumstances. Changes in all demand-side variables lagged two years are tested. The theoretical specification is given by the equation below:

$$\Delta RENT_{j,t} = a_0 + \Sigma\beta_{j,t}\Delta GDP_{j,t-i} + \Sigma\gamma_{j,t}\Delta EX_{j,t-i} + \Sigma\omega_{j,t}\Delta RS_{j,t-i} + \varepsilon_t$$

for $i = 0,1,2$; $j = 0,1\ldots5$

where Δ is the first difference operator; *RENT* is the real retail rent; *GDP* is gross domestic product; *EX* is the real consumer expenditure; *RS* is the real value of retail sales; ε_t is the random disturbance term in the current period; *i* represents the number of lags; and *j* presents each of the five European cities.

The results clearly demonstrate the importance of GDP, consumer expenditure and value of retail sales in determining the retail rents in the five European cities. The analysis shows that all demand-side variables are important in explaining the retail rent movements across the cities. In particular, the contemporaneous change in GDP is the most important common determinant.

On the other hand, several studies utilize a demand-supply framework to examine rental changes of retail space. Robertson and Jones (1998) employ both demand-side and supply-side variables, including **local turnover**, **business rates** and **stock of retail space**, in their cross-sectional model of retail rents in twenty-nine Scottish towns in 1989. Results of the regression analysis reveal the dominant influence of turnover on the local urban rents. Stock of retail space is also a

significant factor in the determination of retail rents.

Key *et al.* (1994 cited Tsolacos, 1995, p.520) develop both national and regional models of retail rents in the U.K., incorporating demand and supply conditions. Rental values lagged one and two periods are included in the models to capture cyclical movements in rents. The results suggest that the demand-side variables, namely **real consumer spending** and **retail sales or profits**; and the supply-side variables, including **stock of retail space** and **level of new construction** are important determinants of retail rents in the U.K. (Key *et al.*, 1994 cited Tsolacos, 1995, p.520)

In a general study of commercial rent modelling and prediction in the U.K., Chaplin (2000) identifies **consumer spending** and **new construction orders** of retail space to proxy demand and supply of retail space respectively. In examining the retail property cycle in the U.K., McGough and Tsolacos (1995) use **retail sector GDP**, **consumer expenditure** and **volume of non-food retail sales** as variables, which represent demand pressures on retail space.

Tsolacos (1995) also discusses a macroeconomic model of retail rent determination in the U.K. over the period of 1977-1994. He recognizes the influences of broad economic forces and trends in the retail property market. In his study, he employs two demand-side variables, namely **GDP** and **total consumer expenditure** to proxy broad economic forces. He explains that GDP is a good measure of the

general economic conditions affecting all retail markets in the world, while consumer expenditure is expected to provide a more direct estimate of the demand for retail products and hence retail space. Moreover, he uses **past values of retail rent** to reflect broad trends in the retail rental market of the U.K. The change in **volume of new retail space** is also included in the single-equation regression model to capture supply-side effects. A dynamic model specification is established, in which the change in real retail rent is regressed on the changes in GDP, total consumer expenditure, volume of retail building output and past values of real retail rent. The dynamic specification of the model is given by the following equation:

$$\Delta RENT_t = a_0 + \sum \beta_i \Delta GDP_{t-i} + \sum \gamma_j \Delta EXP_{t-j} + \sum v_k \Delta RENT_{t-k} + \sum \omega_m \Delta RBOUT_{t-m} + \varepsilon_t$$

for $i=0,1\ldots N$, $j=0,1\ldots T$, $k=0,1\ldots K$, $m=0,1\ldots M$,

where Δ is the first lag operator; *RENT* is real retail rents; *GDP* is the gross domestic product; *EXP* is the total consumer spending; *RBOUT* is the volume of retail building output; and ε is the current stochastic disturbance term.

The results show that the change in retail rent can be explained by changes in past retail rent and GDP lagged five and seven quarters respectively. There is also significant impacts of changes in consumer expenditure with a maximum lag of six quarters, in which the contemporaneous change produces the most significant effect.

It leads to the conclusion that retail rents are sensitive to broad trends in the local markets. However, the retail building output is insignificant, implying that supply-side influence on retail rents is unimportant. The author subsequently uses the model to produce dynamic forecasts of retail rents four quarters ahead.

2.4 Summary of Literature Review

The literature review establishes important theoretical fundamentals for this study. Firstly, it is revealed that the real estate market performance is closely related to economic market fundamentals. Movements of property prices or rents should be correlated with movements of certain macro-market variables. Therefore, this study focuses on the macroeconomic analysis, which attempts to examine the effects of demand-side and supply-side macro-market fundamentals on the aggregate retail rents. Secondly, it is suggested that property rents are generally determined by the demand-supply interaction. This is supported by the significance attached to various demand-side and supply-side variables in some previous studies. They provide justification for this study to be modelled on both demand and supply influences. Thirdly, the common theoretical approaches to rent determination are reviewed in both foreign and local markets. The previous models suggest various variables that are likely to affect retail rents. The demand-side variables commonly investigated are **GDP**, **consumer expenditure**, **business turnover**, **income**, **employment**,

unemployment rate, **inflation rate** and **interest rate**. The supply-side variables commonly included are **existing stock** and **level of new construction**. All these provide inspiring insights into the structure and choice of explanatory variables for the model of this study.

CHAPTER 3 METHODOLOGY

3.1 Introduction

This Chapter attempts to give an overall account of the approach for identification and analysis of the major determinants of retail rents at the macroeconomic level in Hong Kong. Section 3.2 will introduce the multiple regression technique and the statistical tool for constructing the retail rent model. Section 3.3 will briefly describe the development processes of the model.

3.2 Regression Analysis

This study aims at recognizing and analyzing the major retail rent determinants at an aggregate level in Hong Kong. To describe the relationships between retail rents and a number of proposed explanatory variables, it is common to use multiple regression analysis as the statistical technique.

This study will model the average retail rent in a single-equation econometric function estimated by Ordinary Least Squares (OLS) technique. That means the function will be estimated from a pool of data in a way that will minimize the sum of the squared differences between the actual and estimated values. Since there is no prior knowledge about the functional form, it is assumed to be linear for sake of simplicity. Therefore, the retail rent model is represented by the following general

linear function:

$$\text{RENT} = a_0 + a_1 X_1 + a_2 X_2 + \ldots + a_n X_n + \varepsilon$$

where RENT is the average retail rent, which acts as the dependent variable; X_1, X_2, … , X_n are the n explanatory/independent variables to be tested; a_0 is the constant term; a_1, a_2, … , a_n are the partial coefficients to be determined; and ε is the stochastic error term.

From the empirical regression result computed, the following information can be determined:

(1) Coefficient of Determination

The R-squared or adjusted R-squared indicates the proportion of variation of the average retail rent that can be explained by variations of the independent variables i.e. it indicates the explanatory power of the model specification. The closer its value to one, the better the model specification. The adjusted R-squared will be interpreted since its value is not affected by the addition of further variables into the model.[9]

(2) F-statistic

The F-statistic tests the null hypothesis that all the partial coefficients[10] are equal to

[9] Conversely, the value of R-squared increases as more independent variables are added to the model, irrespective of whether they are significant.

[10] See the description of Partial Coefficients in Part (4) on the next page.

zero. If it is greater than the critical value[11], the null hypothesis is rejected.

(3) t-statistics

The t-statistic of each explanatory variable will determine whether the variable is a significant determinant of the average retail rent. If the t-statistic is greater than the critical value[12], the variable is statistically significant. Alternatively, the p-value can also be used. The closer the p-value to zero, the more significant the variable.

(4) Partial Coefficients

The absolute values of the partial coefficients will tell the marginal effect of a unit change of an explanatory variable on the average retail rent *ceteris paribus*. The sign of the partial coefficient will indicate whether the relationship between the average retail rent and the explanatory variable is positive or negative.

Statistical Tool

To perform the linear regression analysis, a computer software, Statistical Package for the Social Sciences (SPSS)[13], will be used. The stepwise function will be chosen to remove insignificant variables from the final specification. This can minimize their

[11] The critical value of F-statistic is determined from the Table of F-Distribution with reference to the significance level (95% in this study) and two different degrees of freedom i.e. the number of independent variables, and the number of observations minus the number of independent variables minus one.

[12] The critical value of t-statistic is determined from the Table of t-Distribution with reference to the significance level (95% in this study) and the degree of freedom i.e. the number of observations minus the number of independent variables minus one.

[13] SPSS Version 11 for Windows, Release 11.0.0 (19 September 2001), Standard Version. Copyright © SPSS Inc., 1989-2001.

disturbance effect on other significant variables, while arriving at the best final specification at the same time.

3.3 Development of the Model

The empirical analysis of this study is based on the theoretical principle of the demand-supply interaction as reviewed in Chapter 2. A single-equation model will be constructed. The average retail rent will be regressed on a number of macroeconomic series of both demand-side and supply-side variables. Following the contention that the property market and the economy are closely interrelated, most of the demand-side variables to be selected are indicators of broad economic fundamentals. All of them should proxy the demand for retail space either directly or indirectly by reflecting the demand for retail goods and services under the concept of derived demand. Some explanatory variables will be chosen based on economic prior grounds and support from the relevant literature, while the others will be included with references to the local situations in Hong Kong. The variables in the model that cannot be measured directly will be represented by proxies. Theses proxies will be chosen based on their high correlations with the variables and availability of data in Hong Kong. Therefore, the validity and reliability of the model will be partly dependent upon the quality of these proxy data.

The initial retail rent model based on the general demand-supply function will be refined to a linear regression model. Given that most of the demand-side variables are closely related to the macroeconomy and are characterized by the same broad economic trend, there may be close correlations among them. This suggests that multicollinearity may exist and will cause distortion in the final result. In an attempt to minimize such distortion and to study the dynamic relationship between retail rents and the proposed factors, change in the average retail rent will be regressed on the changes in the demand-side and supply-side factors. The seasonal difference (year-on-year change) of each variable, which is determined by the difference between a current figure and its counterpart in the same quarter one year before, will be used. This is to avoid the possible seasonal effects[14] of some variables, which make direct quarter-on-quarter comparison undesirable.

Considering the possible frictional response of retail rents to the changes in independent variables, time lag effects will be incorporated. For each independent variable, both contemporaneous and lagged changes will be considered. It is expected that the effects of all variables will develop into the retail market and influence retail rents within a period of up to two years. This time frame provides sufficient time for

[14] As an illustration, retail sales is commonly affected by seasonal effects as retail activity is often more vigorous during holidays e.g. Christmas, Chinese New Year and summer months. The use of seasonal differences serves to address the holiday effect, which cannot be achieved by direct comparisons between consecutive quarters.

rental adjustments to take place in response to changes in macroeconomic conditions. However, there is no prior knowledge on the exact time lag of each variable. In order to find the best lag structure of each variable, the first step will estimate the correlations between retail rents and all the lagged/contemporaneous changes of each independent variable by bivariate analysis using the Pearson Test. The lagged or contemporaneous change(s) that have significant correlations at the 0.05 level will be selected for the next step. This first step will reduce the otherwise huge number of combinations of independent variables to be tested by trial and error later. Next is to form different combinations of independent variables. Each combination will be formed by a lagged/contemporaneous change of each variable selected from the first step. Then the change in the average retail rent will be regressed on each combination by the OLS technique. In order to remove the insignificant variables, a step-wise procedure will be applied. Finally, the best model specification with the highest explanatory power (as measured by the adjusted R-squared) will be produced. The appropriate time lag of each variable can be determined directly from the final specification.

The excluded variables in the estimation results will be highlighted and proposed with explanations. The signs of partial coefficients of the significant variables will be identified to study their effects on retail rents, and to justify whether they conform to

the initial expectations. The relative degrees of influences of different significant factors will also be examined by comparing the absolute values of their partial coefficients.

CHAPTER 4 EMPIRICAL MODEL

4.1 Introduction

This Chapter attempts to provide an overview of the empirical model for investigating the major macroeconomic determinants of retail rents in Hong Kong. Section 4.2 will identify the explanatory variables that are hypothesized to influence retail rents in Hong Kong. The initial model specification will be constructed based on a linear regression function. Section 4.3 will give a detailed account of all proposed variables in the model, with reference to past literature and the local situations in Hong Kong. Justifications for choosing these variables will be provided. Section 4.4 will examine the expected effects of the selected explanatory variables on retail rents. Their expected signs of partial coefficients will also be specified. Section 4.5 will define the period of study and specify the definitions and sources of the proxy data to be employed in the model.

4.2 Model Specifications

As reviewed, retail rents are expected to respond to both demand and supply conditions in the retail market, the average retail rent is therefore specified as a general function of demand and supply as follows:

Retail Rents = *f (Demand, Supply)*

In the linear regression equation, Retail Rent ($RENT_t$) is regressed on the macroeconomic series of both demand-side factors (D_t) and supply-side factors (S_t). That is,

$$RENT_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i D_{it} + \sum_{j=n+1}^{m} \alpha_j S_{jt} + \varepsilon_t \quad (1)$$

where α_0, α_i and α_j are the coefficients to be determined; t represents the current period; and ε_t is the current stochastic error term.

Change in the average retail rent will be incorporated as the dependent variable; while changes in the variables selected to proxy demand and supply influences will be included as independent variables.[15] In order to capture the probable frictional response of retail rents to fluctuations of certain explanatory variables, different variables are expected to have different time lags. It is assumed that all the selected variables will influence the average retail rent within a period of up to two years. Since quarterly data will be used, the maximum time lag incorporated for each explanatory variable is confined to eight periods. This subsequently refines the general Equation (1) to the following specification:

$$RENT_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i D_{t-ki} + \sum_{j=n+1}^{m} \alpha_j S_{t-kj} + \varepsilon_t \quad (2)$$

for each of k_i = 0, 1, 2, 3, 4, 5, 6, 7 or 8

[15] The changes in all variables are year-on-year seasonal differences. The change in each variable is determined by the difference between its current figure and its counterpart in the same quarter one year before. The reasons for using seasonal differences instead of absolute values are provided in Section 3.3.

where k_i is the number of lag(s) for the i^{th} demand-side variable; and k_j is the number of lag(s) for the j^{th} supply-side variable.

This study focuses on the macroeconomic analysis of the demand-side and supply-side influences on the average retail rent. The review of previous rent determination models identifies several common variables used to proxy the demand for retail products and/or retail space. With specific considerations of the local situations in Hong Kong, nine demand-side variables are hypothesized to affect the overall retail rent and incorporated into the model specification. They include Gross Domestic Product (GDP), Retail Sales (SALE), Mortgage Rate (MORT), Inflation (CPI), Income (INCOME), Unemployment (UNEM), Stock Market Performance (HSI), Visitors (VISIT) and Departure (DEPART). These demand-side variables are in close connections with the broad trends of the economy and the retail market. They can capture the demand for retail goods and services, and thus retail space. On the supply-side, Supply of Retail Space (NEW) is used as the variable. However, due to data unavailability of the total retail stock, only the new completions of retail space is used to proxy this variable. It can only represent part of the supply-side influence since it does not allow for the effect of existing stock of retail space on retail rents. The proxy for each of the variables is summarized in Table 4.1. Justifications for choosing these explanatory variables are provided in the next section. The model

specification for this study is given by the following dynamic equation:

$$\Delta RENT_t = a_0 + a_1 \Delta GDP_{t-k1} + a_2 \Delta SALE_{t-k2} + a_3 \Delta MORT_{t-k3} + a_4 \Delta CPI_{t-k4} + a_5 \Delta INCOME_{t-k5} + a_6 \Delta UNEM_{t-k6} + a_7 \Delta HSI_{t-k7} + a_8 \Delta VISIT_{t-k8} + a_9 \Delta DEPART_{t-k9} + a_{10} \Delta NEW_{t-k10} + \varepsilon_t \quad (3)$$

for each of $k_1, \ldots, k_{10} = 0, 1, 2, 3, 4, 5, 6, 7$ or 8

where Δ is the seasonal difference operator; GDP is Gross Domestic Product; SALE is Retail Sales; MORT is Mortgage Rate; CPI is Inflation; INCOME is Income; UNEM is Unemployment; HSI is Stock Market Performance; VISIT is Visitors; DEPART is Departure; NEW is Supply of Retail Space; ε_t is the current stochastic error term; and $k_1, \ldots, k_{10}$ represents the number of lag(s) for their respective variables.

Equation (3) is then used for empirical analysis using the data summarized in Chapter 4 and the methodology described in Chapter 3.

VARIABLES IN INITIAL MODEL SPECIFICATION	DENOTED AS	PROXIED BY
Dependent Variable		
Retail Rent	RENT	Retail Rental Index
Independent / Explanatory Variable		
Demand-side Variable		
Gross Domestic Product	GDP	Gross Domestic Product
Retail Sales	SALE	Total Retail Sales Value Index
Mortgage Rate	MORT	Average Effective Mortgage Rate
Inflation	CPI	Consumer Price Index
Income	INCOME	Index of Payroll Per Person
Unemployment	UNEM	Unemployment Rate
Stock Market Performance	HSI	Hang Seng Index
Visitors	VISIT	Number of Incoming Visitors
Departure	DEPART	Number of Hong Kong Residents Travelling Abroad
Supply-side Variable		
Supply of Retail Space	NEW	New Completions of Retail Space

Table 4.1 Summary of Proxies of Different Variables

4.3 Investigations of Variables for Regression

In this section, all variables in the proposed retail rent model will be investigated. For the dependent variable i.e. Retail Rent (RENT), its general trend in Hong Kong will be examined to provide an insight into the local retail rental market. For the independent variables, each of them will be evaluated to explain why it is employed as explanatory variable. Justifications will be made with references to past literature and the local situations in Hong Kong. Moreover, their general conditions and trends in Hong Kong will be reviewed to demonstrate their implications in the local market.

4.3.1 Dependent Variable

Retail Rent (RENT)

Retail Rent (RENT), which is the average retail rent in Hong Kong, is regressed on ten explanatory variables to determine the major determinants of retail rents at an aggregate level. The actual values of the average retail rents or rental indices should be used to measure this variable for all retail space, including street shops and retail space in shopping centres.

Retail Rent in Hong Kong

In Hong Kong, Private Retail Rental Index compiled by the Rating and Valuation

Department (2004 website) measures the change of the average retail rent per square meter with reference to a base year. There was an increasing trend of retail rents over the period 1990-1995. It was followed by a slight drop and then increased to the highest level by the end of 1997. The retail market was under tremendous downward pressure over 1998 and 1999 amidst the contraction of the economy as the regional financial crisis took its roll. The retail sector was hit by sluggish demand resulted from a prolonged slump in retail sales. Over the recent years, the average retail rents have experienced a decreasing trend as landlords have been more flexible in offering competitive rents to attract tenants. (see Figure 4.1) In 2002 Q4, the average monthly retail rent was HK$809 per square meter.[16]

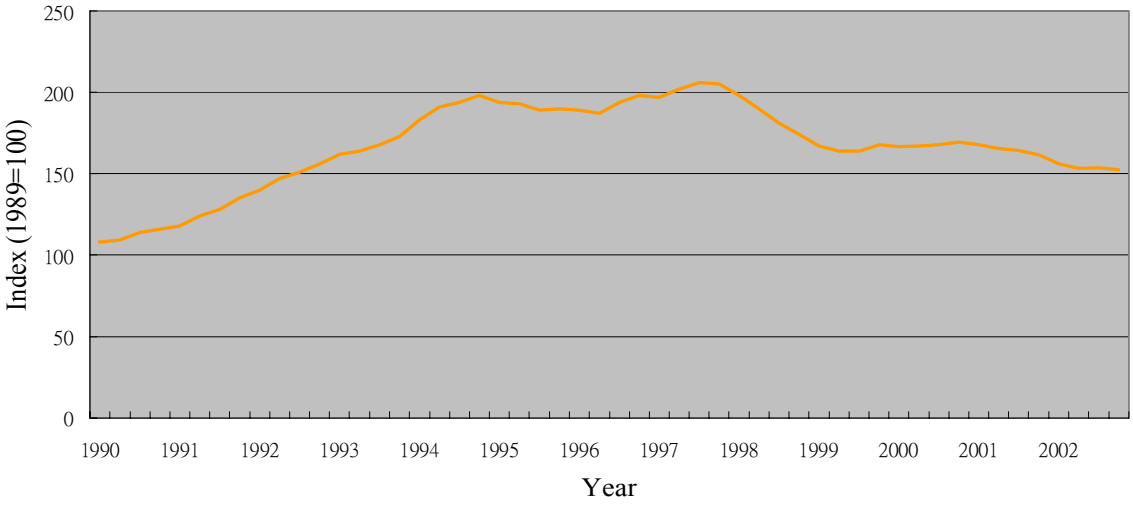


Figure 4.1 Private Retail Rental Index (1989 = 100) in Hong Kong

Source: Rating and Valuation Department (2004 website)[17]

[16] In 2002 Q4, the average monthly rents in Hong Kong, Kowloon and New Territories were HK$796/m^2, HK$943/m^2 and HK$688/m^2 respectively. Source: Rating and Valuation Department. (2003a). *Hong Kong Property Review – Monthly Supplement Oct 2003*. Hong Kong: Rating and Valuation Department.

[17] Rating and Valuation Department. (2004 website). *Website of Rating and Valuation Department*. [online] Available from: http://www.info.gov.hk/rvd/property/index.htm/ [Accessed 8-3-2004]

4.3.2 Independent Variables

Demand-side Variables

Gross Domestic Product (GDP)

According to the Census and Statistics Department (2004 website), GDP is "a measure of the total value of production of all resident producing units of a country or territory in a specified period, before deducting allowance for consumption of fixed capital". GDP is employed in the model of this study because it is a worldwide accepted indicator of a territory's economic conditions. It is often regarded as the most comprehensive measure of the aggregate economic activity because it is compiled from the consumption and expenditure activities of a place. (Ervi, 2002) The direct relationship between GDP and the economy is put forward by Key *et al.* (1994, p 17):

> *"Economic cycles are by convention defined by fluctuations in the GDP growth rate, either absolute fluctuations in growth, or in the growth rate around an underlying trend, or in the level of GDP against the productive capacity of the economy."*

GDP is frequently employed in previous macroeconomic studies. In a local study on the property cycle by Hui and Lui (2002), GDP is employed in the model to act as an economic indicator. It is also used as a proxy of household income in Hong Kong for the reason that increase in GDP signifies improvement in wealth and hence income

level of local people. With respect to the office sector, GDP is often used as a demand-side variable for rent determination because it is a reasonably good proxy of office occupiers' profitability, which in turn determines the demand for office space and hence its rentals. (Leishman, 2003) In the European studies of Gardiner and Henneberry (1988) and D'Arcy *et al.* (1997b, 1999), GDP is shown to be more significant than other narrower indicators of demand such as service sector employment and income. This can be justified by Liow (2000) that GDP is usually an aggregate measure of all industries, so that it can act as a broad indicator of the economy.

Liow (2000) further illustrates the influence of GDP on rentals of commercial space. The author states that increase in GDP means economic growth, which stimulates the demand for different commercial services. This in turn leads to higher demand of expanding firms for commercial space. Eventually, there will be positive influence on the rentals of commercial space.

Regarding the retail sector, a number of previous studies also demonstrate the importance of GDP as a macroeconomic determinant of retail rents. Tsolacos (1995) employs GDP as a demand-side variable in retail rent analysis in the U.K. He explains that GDP is a good measure of the general economic conditions affecting all retail markets in the world. Similarly, D'Arcy *et al.* (1997a) also include GDP in their

econometric retail rent model to capture retail turnover in five European cities. The results clearly demonstrate that the contemporaneous change in GDP is the most important common determinant across the cities.

On the other hand, some previous researches show that the rental levels, in both office and retail sectors, are influenced by GDP, which are registered with time lags. Gardiner and Henneberry (1988) include both contemporaneous GDP and GDP lagged two years to capture its delayed influence on the demand for offices in Europe. The empirical result of D'Arcy *et al.* (1999) indicates that GDP lagged one year is a significant determinant of office rent in Europe. On the other hand, Tsolacos (1995) shows that changes in real retail rents are affected by changes in GDP lagged five and sever quarters respectively. This is justified by the author that when the economy expands, the retail rental market will experience the economic influence with a time lag of at least one year. As a result, time lag effects should be taken into account when GDP is used in this study.

Despite the commonality of employing GDP in rent determination models, its use is subject to a number of counter-arguments and practical limitations. Jones (1995) argues that GDP is not an obvious measure of the demand for office space because commercial services only represent approximately 60 per cent of the national GDP in

the U.K.[18] and the relationship between the demand for commercial services and GDP is not necessarily positive. Moreover, the author points out that the GDP figures are constantly subject to revision and this makes the development of a rent forecasting model difficult. Furthermore, GDP is evidenced by Ball, Lizieri and MacGregor (1998) to be only weakly correlated to property investment in the U.S.

Regardless of these shortcomings, change in GDP is included in the model of this study to capture the effects of general economic conditions in Hong Kong. In view of the possible time delay effect, both contemporaneous and lagged changes in GDP should be considered during the modelling of the regression function. This is to capture the probable delayed influences of changes in economic output on the occupation demand for retail space.

GDP in Hong Kong

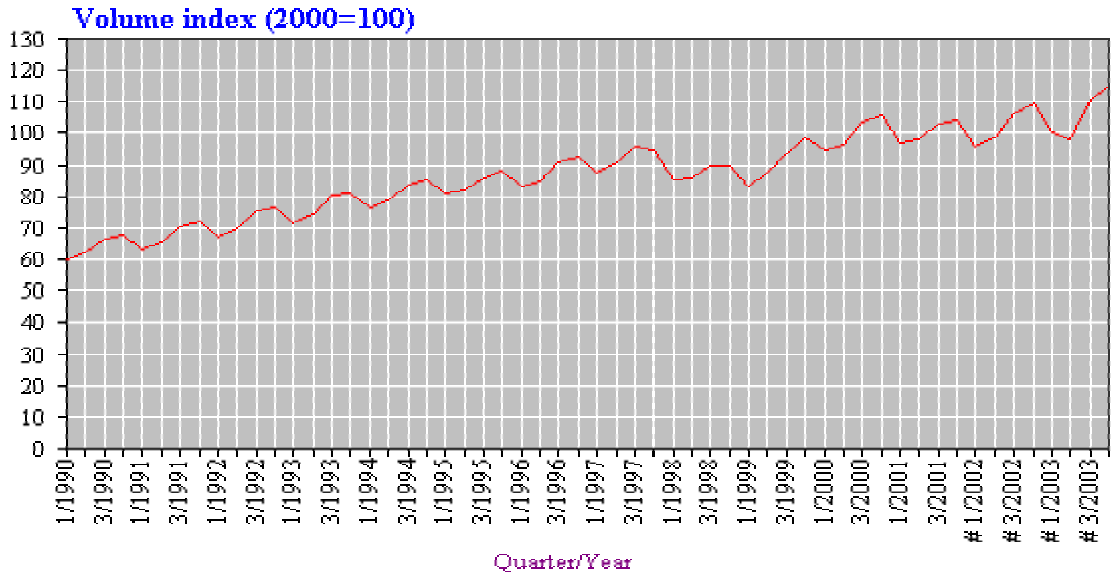
In the context of Hong Kong, GDP is also regarded by the Census and Statistics Department (2004 website) as an important economic indicator for analyzing the economic situation by reflecting the level of production in the territory. Over the past decade, despite the existence of short-term negative growths, GDP in Hong Kong has experienced a gradual overall growth trend, indicating an ongoing growth of the

[18] With respect to the retail sector, the value of the component of Private Consumption Expenditure accounts for approximately 60% of the total GDP. This is shown in Table 4.2.

general economic conditions. (see Figure 4.2) The GDP of Hong Kong had generally recorded positive increase of year-on-year percentage change, subject to some exceptions, particularly the significant negative increases in 1998 and 1999 when Hong Kong was suffering from the economic recession resulting from the Asian Financial Crisis. (see Figure 4.3)

For GDP under the expenditure approach[19], the component of private consumption expenditure (PCE) is a comprehensive measure of the overall household spending on consumption goods and services purchased locally or outside Hong Kong. (Census and Statistics Department, 2004 website) It accounted for approximately 60 per cent of the overall GDP in 1999, but had dropped to about 55 per cent in 2002. However, PCE is different from retail sales statistics in that it covers household expenditure on public utilities and various services e.g. housing, transport, education, medical and health care, recreation and entertainment. Moreover, it includes Hong Kong residents' spending abroad but excludes visitors' spending in Hong Kong, as in contrast with the retail sales figures. (Census and Statistics Department, 2004 website) Therefore, this study should not use PCE as an indicator of demand for retail goods and services, which should instead be proxied by the retail sales statistics.

[19] Under the expenditure approach, GDP is compiled as the total final expenditures on goods and services (including private consumption expenditure, government consumption expenditure, gross domestic fixed capital formation, changes in inventories and exports of goods and services), less imports of goods and services.
Source: Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

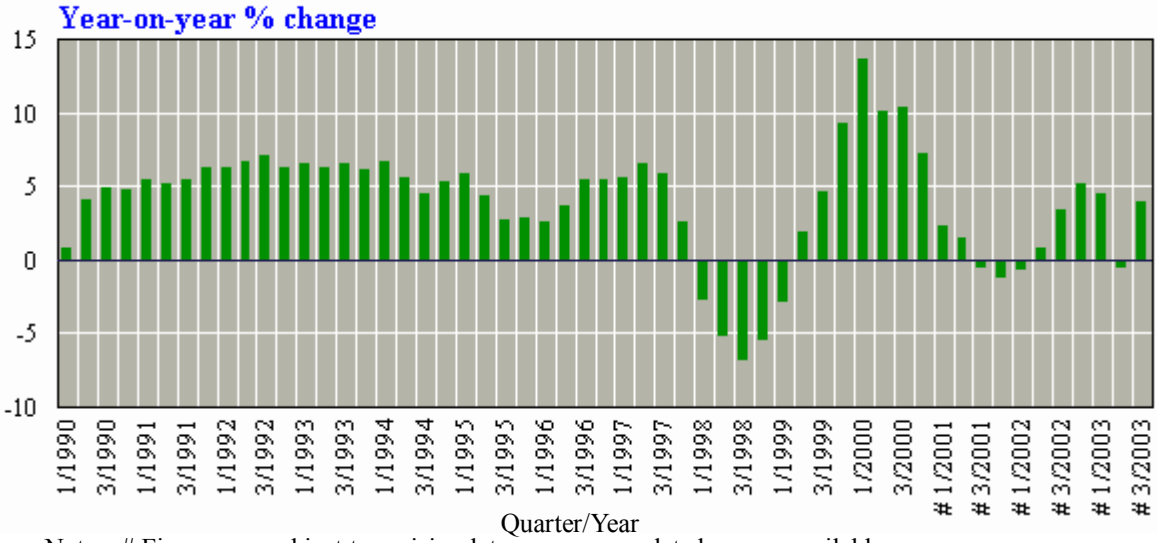


Notes # Figures are subject to revision later on as more data become available

Figure 4.2 Volume Index of Gross Domestic Product (2000 = 100) in Hong Kong

Source: Census and Statistics Department (2004 website)[20]

[20] Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]



Notes: # Figures are subject to revision later on as more data become available

Figures are the latest data released on 28 November 2003.

Figure 4.3 Year-on-year Percentage Change of Gross Domestic Product in Hong Kong

Source: Census and Statistics Department (2004 website)[21]

Ratio of expenditure components to GDP at current market prices (%)		**1997**	**2001@**	**2002@**
Private consumption expenditure		60.0	58.3	55.7
Government consumption expenditure		8.4	10.1	10.3
Gross domestic fixed capital formation		33.6	26.7	23.9
Changes in inventories		0.9	-0.2	0.3
Exports of goods (f.o.b.)		108.3	115.8	122.8
Exports of services		21.7	25.3	27.7
Less:	*Imports of goods (f.o.b.)*	*118.2*	*121.1*	*126.0*
	Imports of services	*14.6*	*14.8*	*14.9*
GDP		100.0	100.0	100.0

Notes: @ -- Figures are subject to revision later on

Figures are the latest data released on 28 November 2003.

Table 4.2 Ratio of Expenditure Components to GDP at Current Market Prices in Hong Kong

Source: Census and Statistics Department (2004 website)[22]

[21] Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[22] *Ibid.*

Retail Sales (SALE)

Under the concept of derived demand, the occupation demand for retail space is derived from the demand for retail goods and services. From retailers' point of view, retail space is a factor of production for their business. Hence, retail rents are determined by the demand for retail products. Isaac (1998) and Leishman (2003) both put forward that consumer spending in the retail sector determines retail business sales and hence retail rents. Many previous studies on retail rent determination at the macroeconomic level use consumer expenditure as an estimate of the demand for retail products. Tsolacos (1995) suggests that consumer expenditure is an indicator of retail market conditions and is taken into account during rent negotiations in the U.K. D'Arcy *et al.* (1997a) also employ change in real consumer expenditure as a demand-side variable to capture retail turnover. The result supports that consumer expenditure is an important macroeconomic determinant of retail rents across the five European cities.

However, consumer expenditure is not used as a demand-side variable in this study. Firstly, there is no public data of the volume of consumer expenditure in the retail sector. The component of PCE of the GDP under the expenditure approach is not employed since it covers household expenditure on public utilities and other services, in addition to the retail products. (see Table 4.3) Furthermore, PCE includes local

residents' overseas spending but excludes tourists' spending in Hong Kong, which should also be considered as a contribution to the demand for local retail goods and services. (Census and Statistics Department, 2004 website) Secondly, the demand for retail goods and services can be directly indicated by the overall retail sales statistics, which are readily available in Hong Kong.

Moreover, retailers' turnover is calculated by subtracting the fixed and variable costs from the revenue, which is mainly determined by the retail sales value. Under the concept of rent surplus theory, which assesses retail rents based on retailers' turnover, retail turnover is expected to have a more direct effect on retail rents. Therefore, retail sales value is used in this study.

Retail sales statistics are commonly used in various past studies on retail rent determination. Hetherington (1988) shows that retail sales volume is the most significant determinant of retail rents in the U.K. The author explains that higher retail sales encourages establishments and expansion of retail business, thereby increasing the demand for retail space and hence its rents. On the other hand, both Key *et al.* (1994 cited Tsolacos, 1995, p.520) and D'Arcy *et al.* (1997a) employ real values of retail sales, in addition to consumer expenditure, to capture retail turnover. The results of both studies demonstrate the significant and positive impacts of real retail sales on retail rents. These provide justifications for its inclusion in the retail rent model.

HK$ million

Year	**Total Private Consumption Expenditure (PCE)**	Percentage of Total PCE of Consumption Expenditure in the Domestic Market			Percentage of Total PCE of Expenditure of Residents Abroad	*Less:* Percentage of Total PCE of Expenditure of Non-residents in Domestic Market
		Food	Consumer goods	Services		
1993	**524,979**	12.3%	42.9%	47.6%	9.1%	*11.9%*
1994	**606,608**	12.2%	41.8%	47.5%	9.3%	*10.8%*
1995	**668,393**	12.6%	40.5%	48.2%	10.1%	*11.3%*
1996	**725,870**	12.7%	40.9%	49.3%	10.0%	*13.0%*
1997	**806,790**	12.0%	38.8%	49.3%	9.7%	*9.7%*
1998	**772,347**	11.6%	33.6%	51.7%	10.8%	*7.6%*
1999	**740,819**	11.8%	31.2%	53.6%	11.1%	*7.7%*
2000	**744,401**	11.9%	31.5%	54.2%	10.8%	*8.4%*
2001	**746,856**	12.1%	30.9%	54.9%	10.7%	*8.7%*
2002	**709,231**	12.3%	30.3%	57.4%	11.0%	*11.1%*

Table 4.3 Percentage Composition of Private Consumption Expenditure in Hong Kong (at current market prices)

Source: Census and Statistics Department (2003a)[23]

Retail Sales in Hong Kong

In 2002, Hong Kong's retail market generated a total retail sales of HK$176,859 millions[24], which contributed to approximately 13.4 per cent of the total GDP[25]. (see Table 4.4) The retail sales of Hong Kong was progressively increasing over the period

[23] Census and Statistics Department. (2003a). *Gross Domestic Product - First Quarter 2003*. Hong Kong: Census and Statistics Department.

[24] Source: Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[25] The GDP of Hong Kong in 2002 was HK$1,323,650 millions, which was a provisional figure and subject to revision later on. (Census and Statistics Department, 2004 website) Thus, the calculated percentage contribution of total retail sales value to GDP is also provisional figure and it gives an approximate estimation only.

1990-1997. However, there was a sharp annual decrease of 16.7 per cent in 1998, which was due to regional financial turmoil that weakened the whole economy and reduced the purchasing power of local citizens and tourists in Hong Kong. Since then, the retail sales has experienced negative year-on-year percentage changes, except in 2000, which marked a 3.8 per cent increase compared to the previous year. (see Table 4.4 and Figure 4.4)

With reference to the contributions of different retail outlets to the total retail sales value in Hong Kong in December 2003 (see Figure 4.5), the category "Other consumer goods" accounted for the largest contribution (17 per cent) to the overall retail sales value. This category of retail outlets includes books, newspapers, stationery and gifts; Chinese drugs and herbs; optical shops; medicines and cosmetics. It was then followed by "Consumer durable goods", including motor vehicles and parts; electrical goods and photographic equipment; and furniture and fixtures, which accounted for 15 per cent of the total sales value. Following were the two categories of "Clothing, footwear and allied products" and "Jewellery, watches and clocks, and valuable gifts", each of which accounted for 14 per cent of the total sales value.

Year	Total Retail Sales Value (HK$Mn)	Value Index (Monthly Average of 10/99 - 9/00 = 100)	Year-on-year % Change
1990	115,365	61.9	+ 7.3
1991	135,388	72.7	+ 17.4
1992	159,498	85.6	+ 17.8
1993	179,783	96.5	+ 12.7
1994	201,150	108.0	+ 11.9
1995	210,560	113.0	+ 4.7
1996	223,920	120.2	+ 6.3
1997	234,857	126.1	+ 4.9
1998	195,675	105.0	- 16.7
1999	179,917	96.6	- 8.1
2000	186,700	100.2	+ 3.8
2001	184,387	99.0	- 1.2
2002	176,859	94.9	- 4.1

Notes: The value index measures the changes in value terms.

Figures are the latest data released on 28 November 2003.

Table 4.4 Summary of Total Retail Sales in Hong Kong

Source: Census and Statistics Department (2004 website)[26]

[26] Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

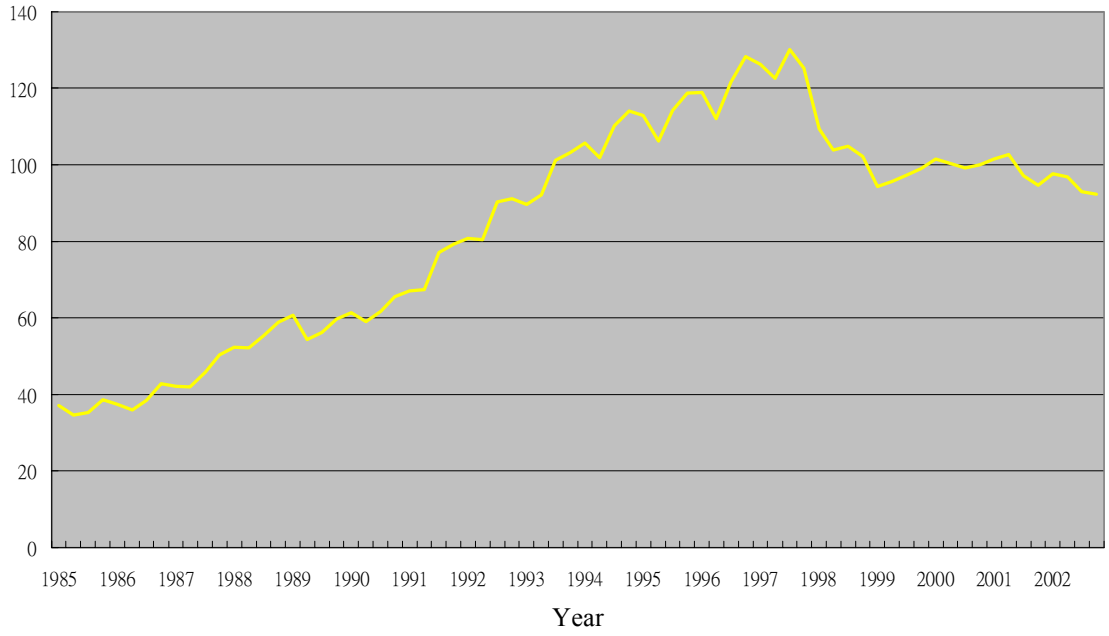


Figure 4.4 Value and Volume Indices of Retail Sales in Hong Kong

Source: Census and Statistics Department (2004 website)[27]

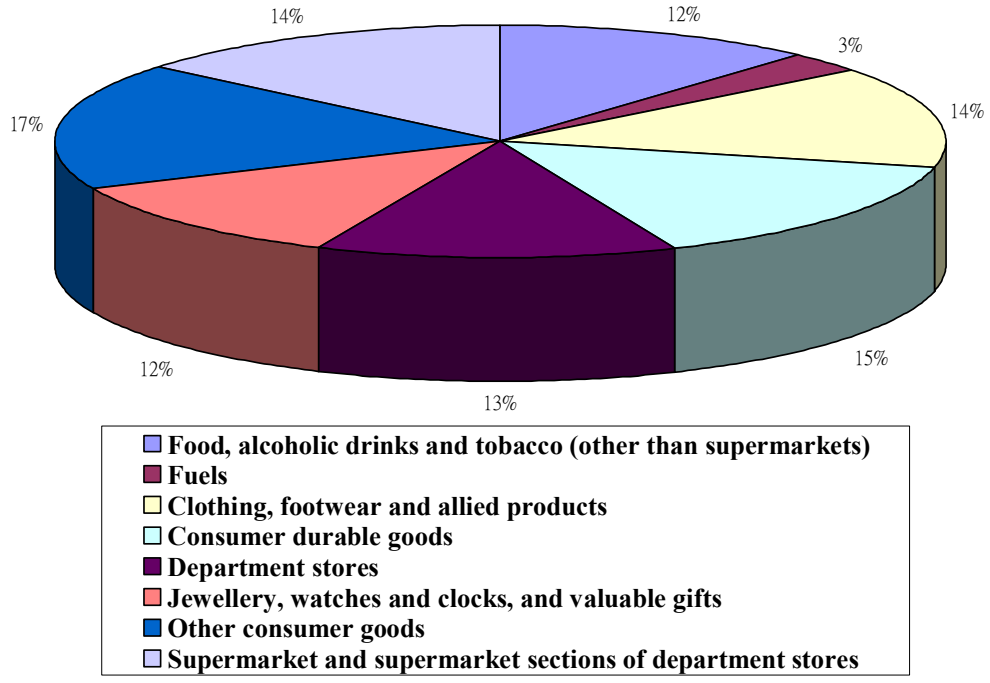


Figure 4.5 Percentage Contribution of Different Retail Outlets to the Total Retail Sales Value in Hong Kong in December 2002

Source: Census and Statistics Department (2004 website)[28]

[27] Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[28] *Ibid.*

Mortgage Rate (MORT)

Purchase of property usually involves a large sum of capital. In most cases, purchasers borrow loans from financial institutions, particularly banks. As a result, the loan interest rate i.e. cost of raising capital, is a crucial factor for interested buyers to make purchasing decisions. Most loans made by banks on property are in the form of mortgages. Mortgage rate determines the amount of monthly installments payable by the mortgagor. Mortgage rate is directly related to the on-going interest rate or more specifically the best lending rates. In the context of Hong Kong, the average effective mortgage rate charged by the principal banks was equal to the best lending rate minus 2.5% throughout 2002.[29] As a result, fluctuations in the best lending rate will influence the mortgage rate.

Mortgage rate is commonly employed in various local and overseas studies to capture the effects of interest rate on property values. As an example, Cotter and Hoesli (1994) use mortgage rate and monthly mortgage payment to proxy interest rate in the determination of residential sales rates in the U.S. Conversely, a local study by Wu (1999) uses the best lending rate to substitute mortgage rate due to data unavailability of the latter. Moreover, mortgage rates are influential determinants of property prices because they affect the cost of capital for potential occupiers or

[29] Sources: Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004] and Financial Services Bureau. (2002). *Economic Background*. Hong Kong: Govt. Printer.

investors at the time of purchasing. This in turn affects the demand for property and hence its prices. This contention is supported by many scholars such as Kling and McCue (1987) and Fraser (1993). Furthermore, compared with interest rate, mortgage rate is more specifically applicable to property market analysis because potential buyers of property usually borrow loans in the form of mortgages, instead of personal loans charged with higher interest rates. All these justify the use of mortgage rate as an explanatory variable in this study.

In the property sales market, higher mortgage rate leads to higher cost of capital for potential buyers, who are then discouraged to purchase property. The lower overall demand in turn places a downward pressure on property prices. Such negative correlations between mortgage rates and property demand or prices are widely shown in previous studies, particularly in the residential property sector. For example, Harris (1989) and Ko (1997) show that housing prices appreciate during periods of declining mortgage rates in the U.S. and Hong Kong respectively. On the other hand, Liow (2000) uses the concept of property yields to explain the negative relationship in the commercial property market in Singapore. The author brings out that in a high interest-rate environment, property yield, as determined by interest rate, increases and will lead to a fall in the present values of property after capitalization.

The relationship between mortgage rate and the demand in the sales market will have a subsequent impact on the rental market, which is the focus of this study. A potential property occupier with occupation demand (not investment demand) can either purchase or rent the property. It means that occupation demands in the sales market and the rental market are substitutes. The tradeoff between them depends on the relative costs of occupying the property in the two markets. Assuming there is no inflation, if mortgage rate is high, the potential occupier will not purchase the property, but will alternatively rent it to save the high cost of capital in purchasing. As a result, higher mortgage rate is expected to drive up property rentals. Such circumstance is shown by some researches, for example, Cheung *et al.* (1995) who confirm the positive impact of interest rates on rents of the residential property in Hong Kong.

Furthermore, mortgage rate is expected to affect existing owners. If an owner cannot afford to pay the mortgage installments as a result of increased mortgage rate, he may sell his premise and rent the same or another one for occupation. According to Fraser (1993 p.319), retailers with cash-flow problems commonly engage in "sale and leaseback", in which they sell their freehold interests on the condition of being granted a lease in return. As a result, this stimulates the demand in the rental market and bids up the rent levels. Because of the substitution effect between the sales and rental markets, retail rents are expected to be indirectly affected by mortgage rates,

which have direct negative impacts on retail prices. It is therefore important to analyze the impact of mortgage rate in this study.

The incorporation of mortgage rate as an explanatory variable is also justified by its direct impact on property rents. As discussed, mortgage rate is directly related to interest rate, and both of them fluctuate closely with inflation rates. They affect the psychological expectations of people on the economic trends. (McGough and Tsolacos, 1995) Rising mortgage or interest rates are commonly perceived as phenomena of a better economy. They also mean higher financial returns for investment and hence better economic performance. These encourage people to spend more on retail goods and services. The higher demand for retail products will promote retail business and lead to higher retail space demand and hence rents.

In addition, many premises, especially retail space, are owned by individual landlords or developers for letting to others i.e. for investment. As mortgage rates increase, the owners' user costs are increased. In order to make their investment profitable, they will shift the burden to renters by increasing the rents charged. Many researches e.g. Dobson and Goddard (1992), Giussani *et al.* (1992), Key *et al.* (1994), D'Arcy *et al.* (1997b), include mortgage or interest rates as explanatory variables for the determination of property rents and they provide support for the inclusion of mortgage rate in this study.

Mortgage Rate in Hong Kong

In Hong Kong, most home buyers borrow money from banks in the form of mortgages. Due to competition amongst banks and differences in the types of property to be mortgaged, the actual mortgage rates charged by various banks may not be the same in all cases.[30] Therefore, the effective mortgage rate, which is the modal value representing the most commonly charged rates charged by principal banks in Hong Kong, is used in this study.

The average effective mortgage rate has been decreasing rapidly since 1998 Q1 amidst the slackened economy. The average mortgage rates in 2001 (4.72%) and 2002 (2.61%) were substantially lower than the average rate in 1998 (10.79%). (see Figure 4.6 and Table 4.5) There is also close relationship between the effective mortgage rates and the best lending rate[31]. (see Figure 4.6) Before 1999 Q2, the average effective mortgage rates were charged higher than the contemporaneous best lending rates. However, the trend has been reversed since 2000 Q1 because of the keen competition among the banks for mortgage business, which drove the rates below the best lending rate. Over the period 2000 Q2 - 2002 Q4, the effective mortgage rates were equal to the best lending rates minus a range of 1.8% - 2.5%. (see Table 4.5) The global economic downturn impacted Hong Kong heavily in recent years. The

[30] Source: Financial Services Bureau. (1996-2002). *Economic Background*. Hong Kong: Govt. Printer.
[31] Best lending rate refers to the rate quoted by the Hongkong and Shanghai Bank.

successive interest rate cuts during 2001 brought mortgage rates down to historic low levels.

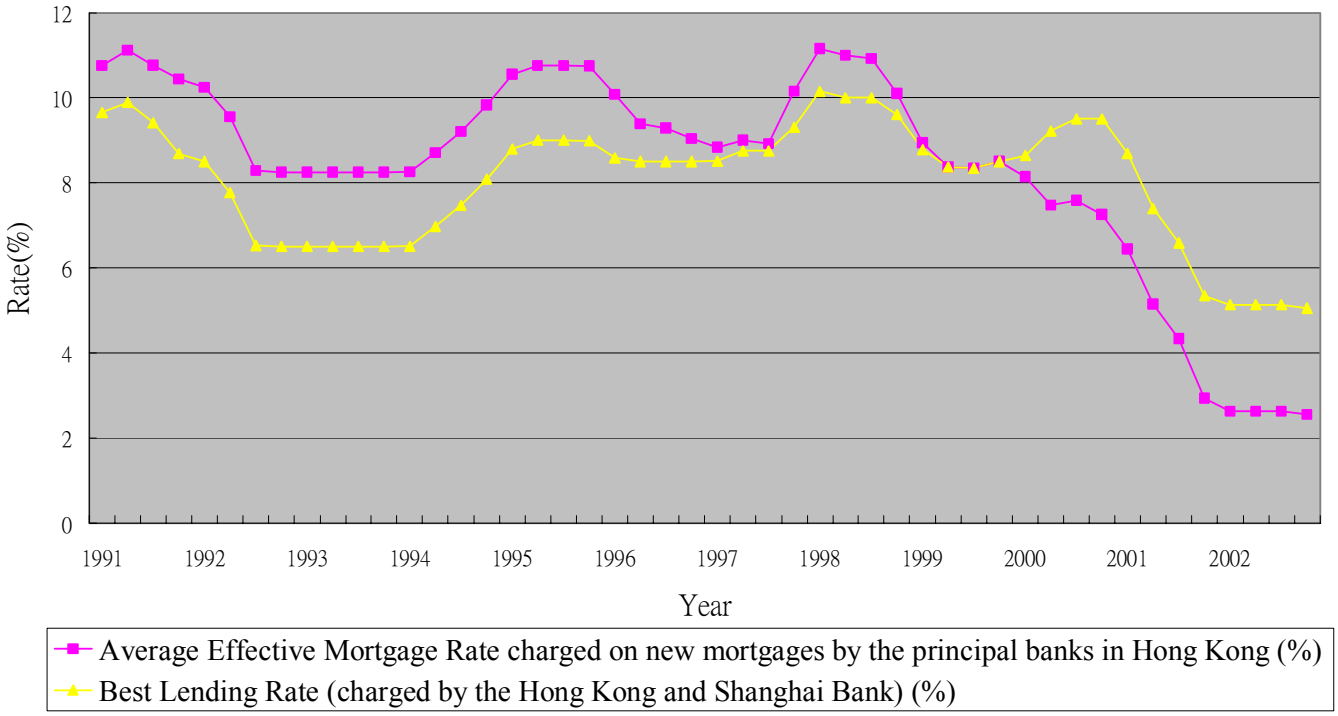


Figure 4.6 Trends of Average Effective Mortgage Rate and Best Lending Rate in Hong Kong

Sources: Census and Statistics Department (2004 website)[32] and Financial Services Bureau (1996-2002)[33]

[32] Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[33] Financial Services Bureau. (1996-2002). *Economic Background*. Hong Kong: Govt. Printer.

Year	Average Effective Mortgage Rate charged on new mortgages by the principal banks in Hong Kong (%) (a)	Best Lending Rate (charged by the Hong Kong and Shanghai Bank) (%) (b)	(a) – (b) (%)
2000 Q1	8.14	8.64	-0.5
2000 Q2	7.47	9.22	-1.8
2000 Q3	7.58	9.5	-1.9
2000 Q4	7.25	9.5	-2.3
2001 Q1	6.44	8.69	-2.3
2001 Q2	5.15	7.4	-2.3
2001 Q3	4.34	6.59	-2.3
2001 Q4	2.93	5.34	-2.4
2002 Q1	2.63	5.13	-2.5
2002 Q2	2.63	5.13	-2.5
2002 Q3	2.63	5.13	-2.5
2002 Q4	2.55	5.05	-2.5

Table 4.5 Average Effective Mortgage Rate, Best Lending Rate and Their Difference in Hong Kong

Sources: Census and Statistics Department (2004 website)[34] and Financial Services Bureau (1996-2002)[35]

[34] Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[35] Financial Services Bureau. (1996-2002). *Economic Background*. Hong Kong: Govt. Printer.

Inflation (CPI)

Inflation is an increase in the general price level of a territory, as opposed to deflation, which means the contrary. It is a common phenomenon due to the constant adjustments of prices of different commodities and services. Inflation is often measured by an inflation index, which reflects the change in prices of a basket of commodity or service.

In Hong Kong, Consumer Price Index (CPI) is used as an inflation index. Property rents is a group of commodity included in the compilation of CPI. (Census and Statistics Department, 2002b) In December 2002, it is assigned with a considerable weight of approximately 27 per cent in the Composite CPI and it was the largest contributor to the rate of change in the Composite CPI.[36] Therefore, the rental level of different property is directly correlated to CPI and hence inflation in Hong Kong.

The effects of inflation on retail rents are two-fold. Firstly, inflation index can reflect the general economic conditions of a territory because from people's viewpoint, rising prices often indicate better economic performance. This follows that a higher inflation index indicates a better economy, which encourages people to spend more on

[36] The weight assigned to the category of property rents in compilation of the Composite CPI for December 2002 was 26.6% and its contribution to the rate of change in Composite CPI was +58.3%. Source: Census and Statistics Department. (2002b). *Monthly Report on the Consumer Price Index, December 2002*. Hong Kong: Census and Statistics Department.

retail goods and services due to higher income, investment return and stronger confidence on the economy. This in turn drives up the occupation demand and hence rents of retail space. It is therefore concluded that inflation has an indirect positive impact on retail rents.

Secondly, inflation is a major factor of interest rate fluctuations. As discussed above, buyers of retail property are more sensitive than renters to changes in interest or mortgage rates as the former usually borrow money from financial institutions in the form of loans or mortgages during purchasing. This in turn has several direct and indirect impacts on retail rents as explained. Hence, inflation is expected to have a consequential effect in the retail rent determination.

Inflation rates are commonly included in the analyses of residential property market e.g. Harris (1989), Cotter and Hoesli (1994). They are also employed in rent determination models for various commercial properties e.g. Key *et al.* (1994), Ng (1998). This implies the significance of inflation, which is therefore included in this study.

Inflation in Hong Kong

Inflation in Hong Kong is measured by CPI compiled by the Census and Statistics Department. It measures the changes over time in the price level of consumer goods

and services generally purchased by households. The year-on-year rate of change in CPI is widely used as an indicator of inflation affecting consumers. (Census and Statistics Department, 2004 website)

CPI is constructed from the price levels of different groups of commodity or service, each of which is assigned with a weight. (see Figure 4.7) The Composite CPI in Hong Kong was increasing progressively over the period 1985-2002, but has experienced a decreasing trend since 2002 Q4. (see Figure 4.8) In December 2002, the Composite CPI was 94.8 with a 3 per cent decrease compared with the previous year.[37]

[37] Source: Census and Statistics Department. (2002b). *Monthly Report on the Consumer Price Index, December 2002*. Hong Kong: Census and Statistics Department.

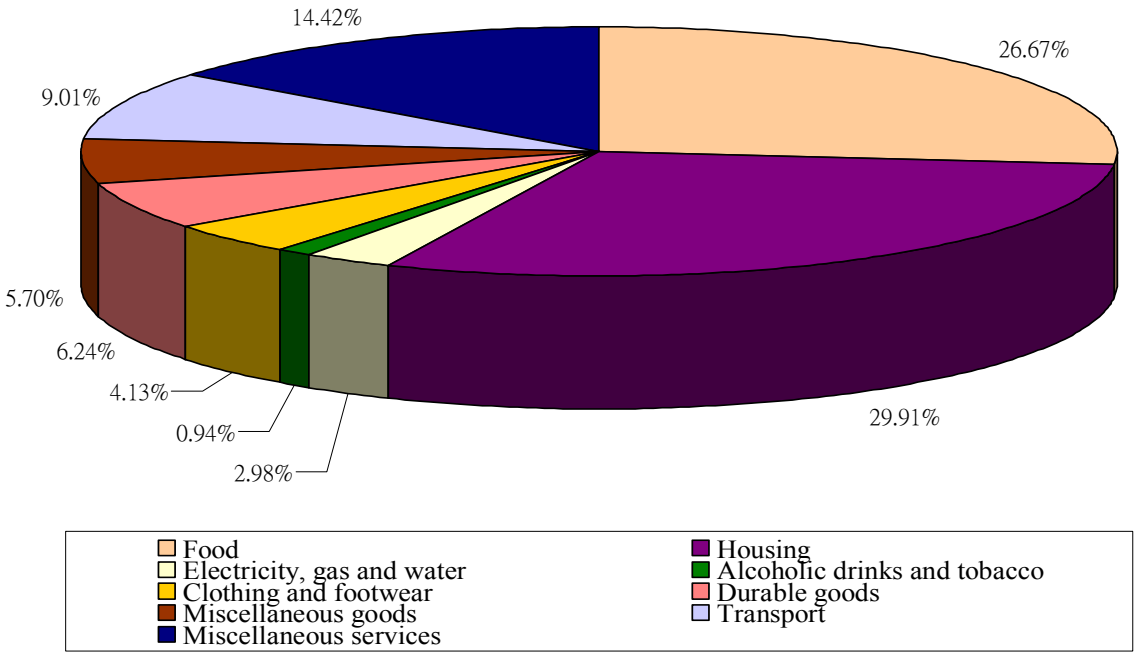


Figure 4.7 Percentage Composition of Different Items in Consumer Price Index in Hong Kong (Oct. 1999 – Sep. 2000 = 100)

Source: Census and Statistics Department (2002b)[38]

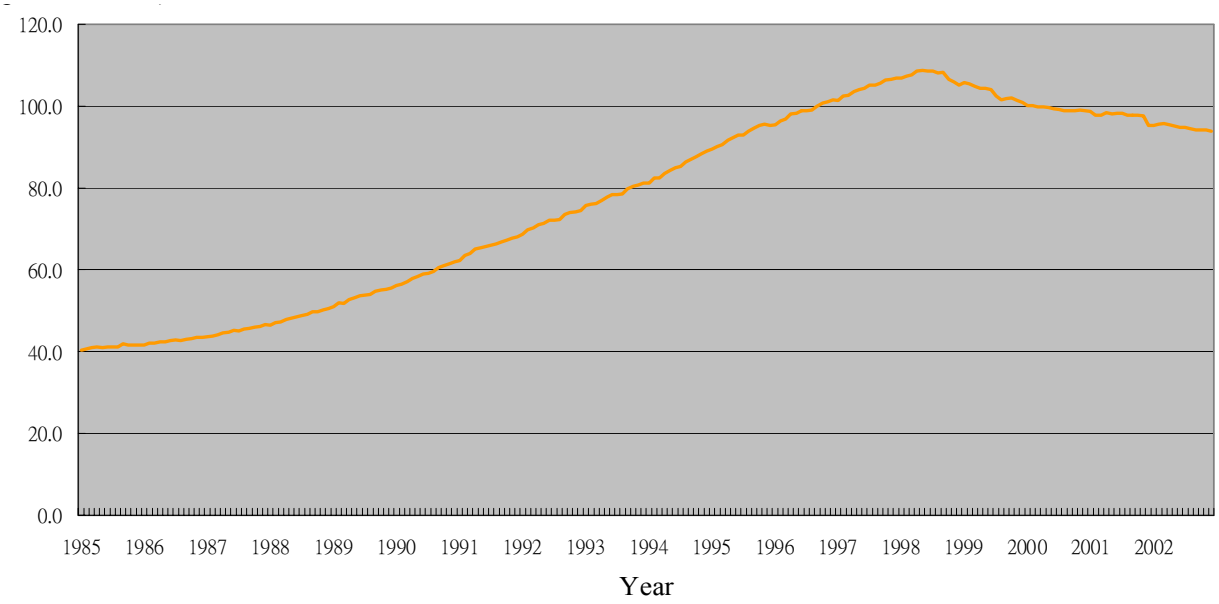


Figure 4.8 Composite Consumer Price Index in Hong Kong (Oct. 1999 – Sep. 2000 = 100)

Source: Census and Statistics Department (2004 website)[39]

[38] Census and Statistics Department. (2002b). *Monthly Report on the Consumer Price Index, December 2002*. Hong Kong: Census and Statistics Department.

[39] Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

Income (INCOME)

The level of disposable income determines the purchasing power of an individual and hence his demand for retail goods and services. Furthermore, it determines the peoples' expenditure patterns. People with higher income tend to spend more on higher order goods. Moreover, they usually spend a higher percentage of their income on investments and taxes than the lower-income group. Therefore, retail sales and turnover depend on the disposable income of potential customers.

At macro-market level, the aggregate income determines the people's aggregate purchasing power and hence the demand for retail goods and services. The aggregate income will ultimately influence the occupation demand for and hence the rentals of retail space.

The importance of income in retail rent determination is demonstrated by numerous previous studies e.g. Hardin III and Wolverton (2000), Schmitz and Brett (2001). Particularly, Fraser (1993) suggests that retail property has a strong positive income elasticity of demand, which means changes in income tend to have a substantial direct effect on occupation demand for retail property. Because of its significant impact on retail rents, aggregate income should be included in the model of this study.

Income in Hong Kong

In Hong Kong, the real index of payroll per person has a gradual increasing trend since 1985 with seasonal fluctuations in each year. (see Figure 4.9) Over the years, the range between upper and lower quartiles of employment earnings has been widening progressively. (see Figure 4.10) In December 2002, the average monthly salary was HK$10,951.[40]

People's expenditure pattern shapes the retail market. In 1999/2000, households spend most on housing, accounting for 32.2 per cent of their total income. For food and other retail goods (including alcoholic drinks and tobacco, clothing and footwear, durable goods and miscellaneous goods), they spend an average of 25.7 and 14.7 per cents of their total income respectively. (see Figure 4.11) In Hong Kong, there is no sales tax and people enjoy a relatively low income tax rate of 15 per cent. Besides, a substantial portion of education, basic health care and housing are publicly funded. In 2001, about 45 per cent of domestic households lived in public rental flats or subsidized sale flats.[41] It is therefore expected that a sizable share of most households' income is disposable in the retail market. Therefore, income levels are anticipated to have significant impact on retail rents.

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[40] Source: Census and Statistics Department (2003c). *Hong Kong Monthly Digest of Statistics, May 2003*. Hong Kong: Census and Statistics Department.

[41] In 2001, 30.6% of households lived in public rental flats; 14.8% in Housing Authority subsidized sale flats; and 0.8% in Housing Society subsidized sale flats. Source: Census and Statistics Department. (2001). *2001 Population Census Main Report – Volume 1*. Hong Kong: Census and Statistics Department.

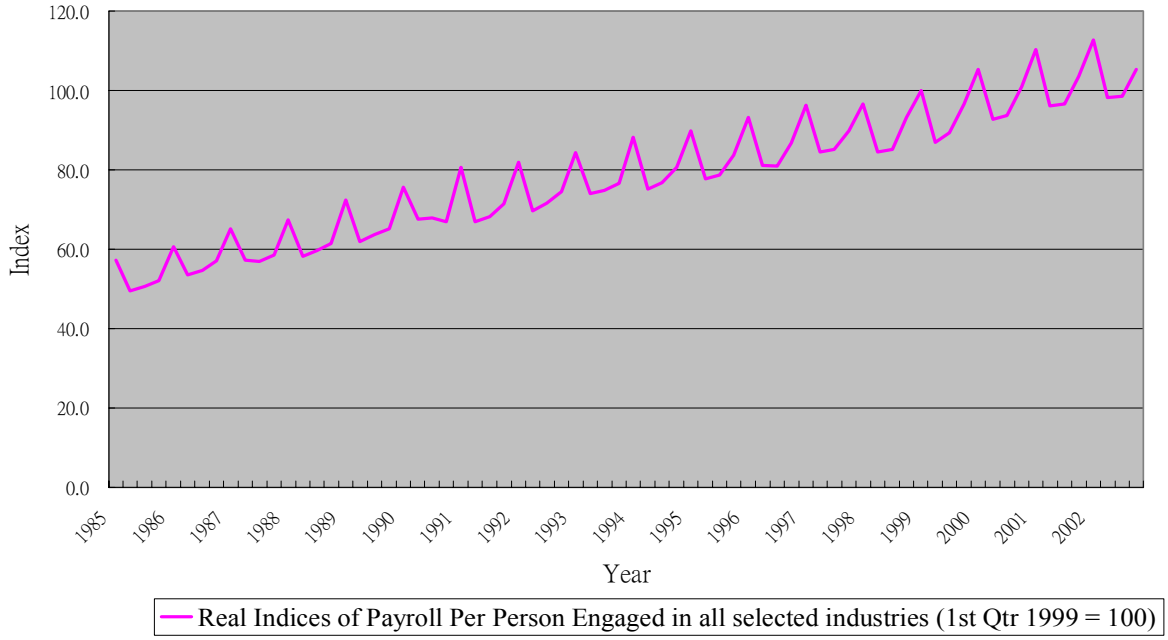

Figure 4.9 Real Indices of Payroll Per Person Engaged in All Selected Industries in Hong Kong

Source: Census and Statistics Department (2003b)[42]

Figure 4.10 Monthly Employment Earnings of Employed Persons in Hong Kong

Source: Census and Statistics Department (2003b)[43]

[42] Census and Statistics Department. (2003b). *A Graphic Guide on Hong Kong's Development, 1967-2002*. Hong Kong: Census and Statistics Department.
[43] *Ibid.*

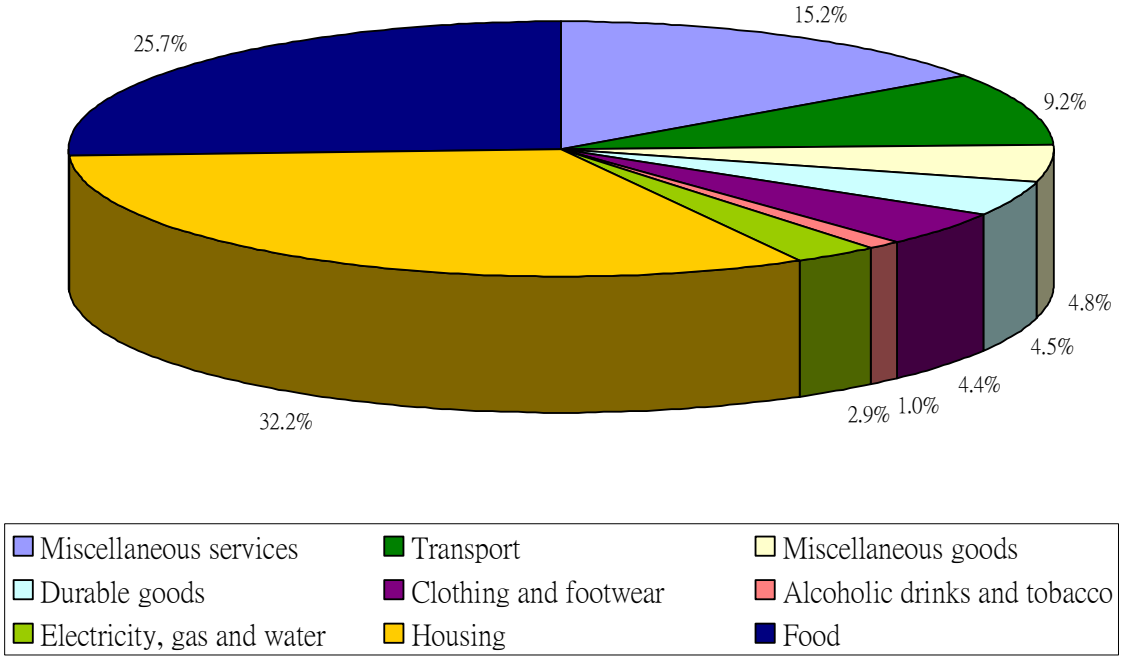

Figure 4.11 Household Expenditure Pattern by Commodity/Service Section in 1999/2000 in Hong Kong

Source: Census and Statistics Department (2003b)[44]

[44] Census and Statistics Department. (2003b). *A Graphic Guide on Hong Kong's Development, 1967-2002.* Hong Kong: Census and Statistics Department.

Unemployment (UNEM)

According to the Census and Statistics Department (2004 website), unemployment rate represents the percentage of people currently available for and seeking a job relative to the labour force aged 15 or above. Unemployment rate is closely related to the aggregate purchasing power of the population because the unemployed people tend to spend less in the retail market. This in turn affects the demand for retail space and hence its rents.

Furthermore, unemployment rate is an economic indicator of a territory. This is supported by Brooks and Tsolacos (1999) and Dobson and Goddard (1992) who use unemployment rates as measures of the general economic conditions. Unemployment rate tends to be lower when the general economic performance is good. Moreover, people often perceive high unemployment rate as indicator of poor economy and will have less intention to purchase retail goods and services. This again lowers the demand for retail space and its rents.

The inclusion of unemployment in this study is supported by some previous studies, which include it in their rent determination models. For example, Cotter and Hoesli (1994) for residential property; and Dobson and Goddard (1992) for commercial property; Hekman (1985), Gardiner and Henneberry (1988) and Giussani *et al.* (1992) for offices.

Unemployment in Hong Kong

From mid-80's to mid-90's, the unemployment rate in Hong Kong stood at a low level of 3% or below. However, the rate has a general increasing trend over the years. As a result of economic slowdown, the rate has been at high level in recent years. (see Figure 4.12) In 2002 Q4, the unemployment rate was 7.2 per cent.[45]

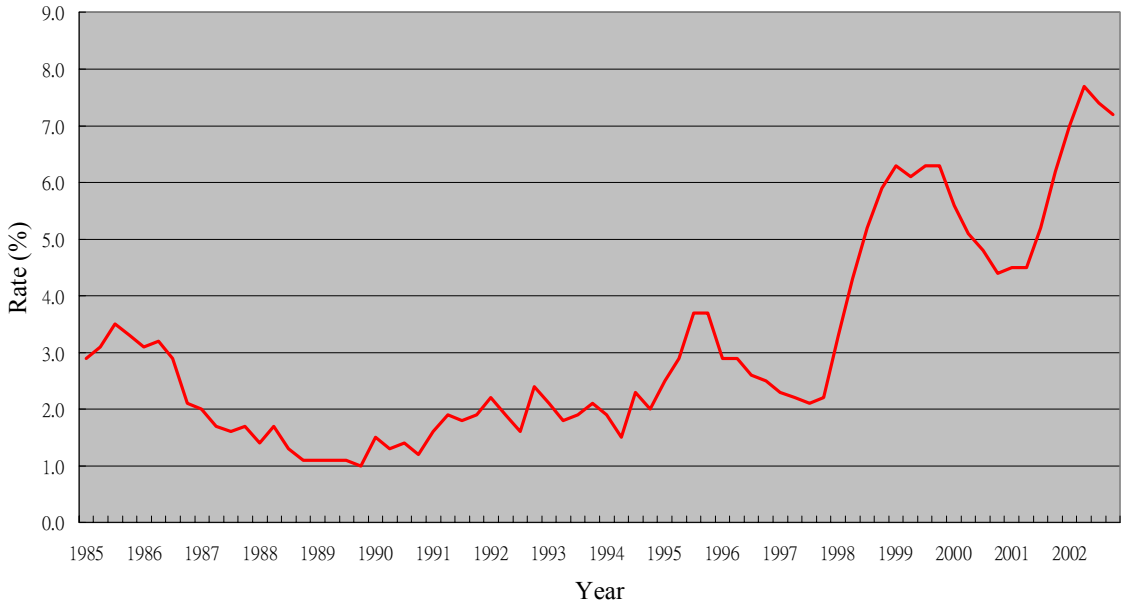

Figure 4.12 Unemployment Rates (Seasonally Adjusted) in Hong Kong

Source: Census and Statistics Department (2004 website)[46]

[45] Source: Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

[46] *Ibid.*

Stock Market Performance (HSI)

As mentioned by Fraser (1993 p.1), property is an integral part of the economy, and any factors that affect the economy will have implications for property. He suggests that stock market performance, although seems to be irrelevant to the property market, have implications on property values. This is particularly true in Hong Kong because it is an international financial centre. Its economy is sensitive to both global and local financial and political conditions, which can be instantly reflected in the stock market. Moreover, shocks in stock market have direct determining effects on the local economy. It is supported by McGough and Tsolacos (1995) who include share prices in the analysis of the U.K. property cycles, based on the contention that share price movement reflects the economic conditions. As explained, the economic performance determines retail rents, therefore, stock market performance is included in the model of this study as a yardstick to proxy the economic conditions.

Stock Market Performance in Hong Kong

The stock market performance in Hong Kong is measured by Hang Seng Index (HSI) compiled by the HSI Services Ltd. HSI is constructed from 33 constituent stocks in Hong Kong. There was an overall growing trend over the period 1991-1997. However, the stock market of Hong Kong was hit badly by the Asian Financial Crisis, leading to

a deep trough between 1998 and 1999. (see Figure 4.13) The annual stock exchange turnover reached its peak in 1997 and dropped to HK$1,643 billions in 2002 due to economic downturn in recent years.[47]

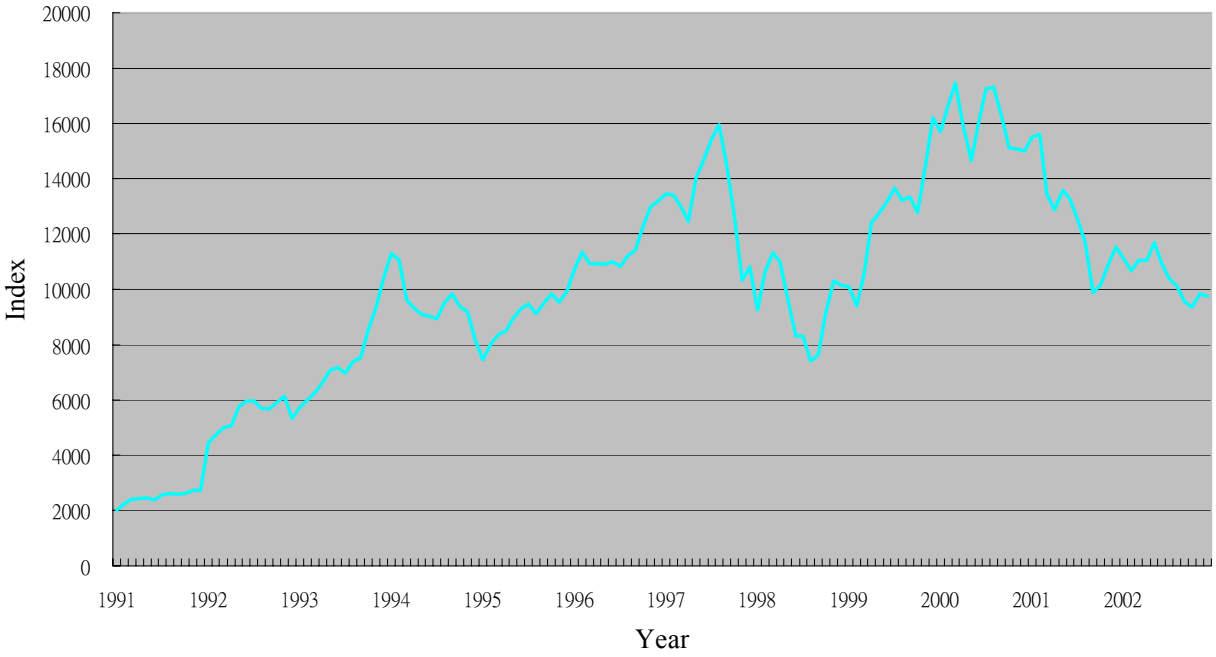

Figure 4.13 Hang Seng Index (31/7/1964 = 100) in Hong Kong

Sources: Stock Exchange of Hong Kong (1991-1999, 2001-2002)[48], HSI Services Limited (2000)[49]

[47] Source: Census and Statistics Department. (2003b). *A Graphic Guide on Hong Kong's Development, 1967-2002*. Hong Kong: Census and Statistics Department.

[48] Stock Exchange of Hong Kong. (1991-1999, 2001-2002). *Stock Exchange Fact Book*. Hong Kong: Stock Exchange of Hong Kong

[49] HSI Services Limited. (2000). *Hang Seng Indexes 2000*. Hong Kong: HSI Services Limited.

Visitors (VISIT)

Part of retail sales is contributed by visitors' spending in the local retail market. This is particularly important in Hong Kong, which has been renowned as a "Shopping Paradise" with a wide selection of international goods for many years. In 2002, Hong Kong served 16.6 millions of visitors.[50] The total expenditure of visitors was approximately HK$56 billions, in which about 50 per cent and 14 per cent were spent on shopping and food respectively.[51] These accounted for about 20 per cent of the total retail sales in Hong Kong.[52]

As a result, the volume of visitors and their spending power determines the overall retail sales, which can proxy the demand for retail products and retail turnover. The demand for retail space and its rents are then subsequently influenced. Hetherington (1988) shows that retail rents in London are closely correlated to the volume of visitors. Therefore, the visitor variable should be included in the model of this study.

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[50] Source: Census and Statistics Department (2003c). *Hong Kong Monthly Digest of Statistics, Dec 2003*. Hong Kong: Census and Statistics Department.

[51] Source: Hong Kong Tourist Association. (2003). *Tourism in Hong Kong – The Figures, 2003*. Hong Kong: Hong Kong Tourist Association.

[52] In 2002, the total retail sales was HK$176.859 billions. Source: Census and Statistics Department. (2004 website). *Website of the Census and Statistics Department*. [online] Available from: http://www.info.gov.hk/censtatd/eng/hkstat/ [Accessed 8-3-2004]

Visitors in Hong Kong

The number of incoming visitors has been increasing progressively, with an exceptional drop over 1997 and 1998. The drop was due to the strike of the regional financial turmoil, which reduced the volume of visitors particularly from the Asian countries.[53] However, the number has been growing again, reaching a high annual level of 16.6 millions in 2002.[54] (see Figure 4.14) The per capita spending of visitors reached its maximum of HK$7151 in 1995 but decreased rapidly over the period 1995-2001. It increased again to HK$5524 in 2002. (see Figure 4.15)

The majority of visitors come from China, accounting for about 40 per cent of total visitors in 2002. This is the result of the relaxation of visa restrictions on visitors from China and the abolition of the quota system for them to join Hong Kong tours in recent years. Visitors from Taiwan and Southeast Asian countries accounted for 15 and 10 per cents of the total number respectively. (see Figure 4.16) About 50 per cent of visitors come to Hong Kong for vacation (see Figure 4.17) and the average length of stays was 3 days.[55] Visitors spend about 50 per cent of their expenditure on shopping; 25 and 14 per cents on hotel bills and food respectively. (see Figure 4.18)

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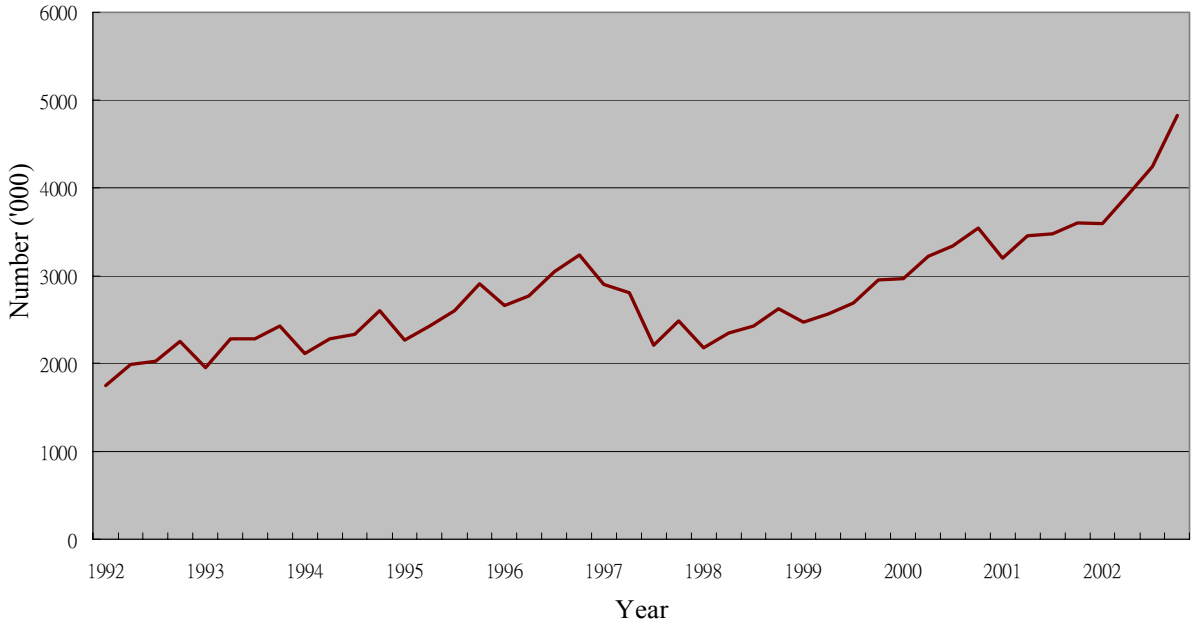
[53] Over the period 1997-1998, the numbers of visitors from North Asia and South and Southeast Asia dropped by 52.2% and 33.1% respectively, compared with other origins (Europe, Africa and the Middle East (-24.2%), Australia, New Zealand and South Pacific (-13.7%), The Americas (-10.6%). Source: Hong Kong Tourist Association. (1998). *Tourism in Hong Kong – The Figures, 1998*. Hong Kong: Hong Kong Tourist Association.

[54] Source: Census and Statistics Department. (2003c). *Hong Kong Monthly Digest of Statistics, Dec 2003*. Hong Kong: Census and Statistics Department.

[55] Source: Hong Kong Tourism Board. (2002). *Visitor Profile Report – 2002*. Hong Kong: Hong Kong Tourism Board.



Notes: Figures include visitors from China and foreign visitors passing via Hong Kong to China

Figure 4.14 Number of Incoming Visitors of Hong Kong

Source: Financial Services Bureau (1992-2003)[56]

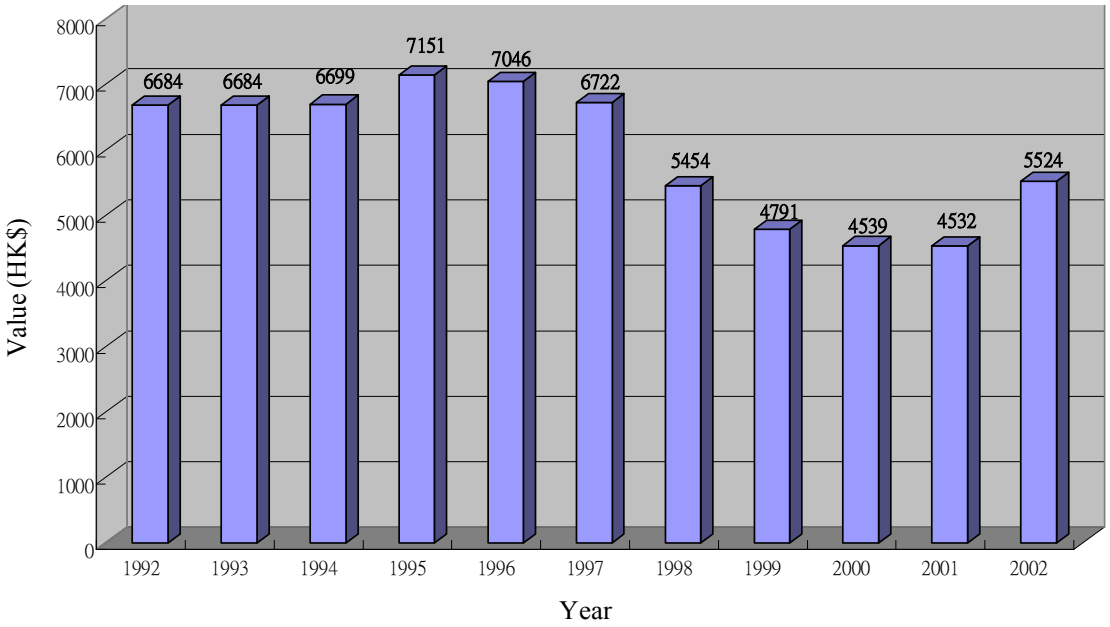


Figure 4.15 Per Capita Spending of Visitors in Hong Kong

Source: Hong Kong Tourist Association (1991-2003)[57]

[56] Financial Services Bureau. (1992-2003). *Economic Background*. Hong Kong: Govt. Printer.
[57] Hong Kong Tourist Association. (1991-2003). *Tourism in Hong Kong – The Figures, 1991-2003*. Hong Kong: Hong Kong Tourist Association.

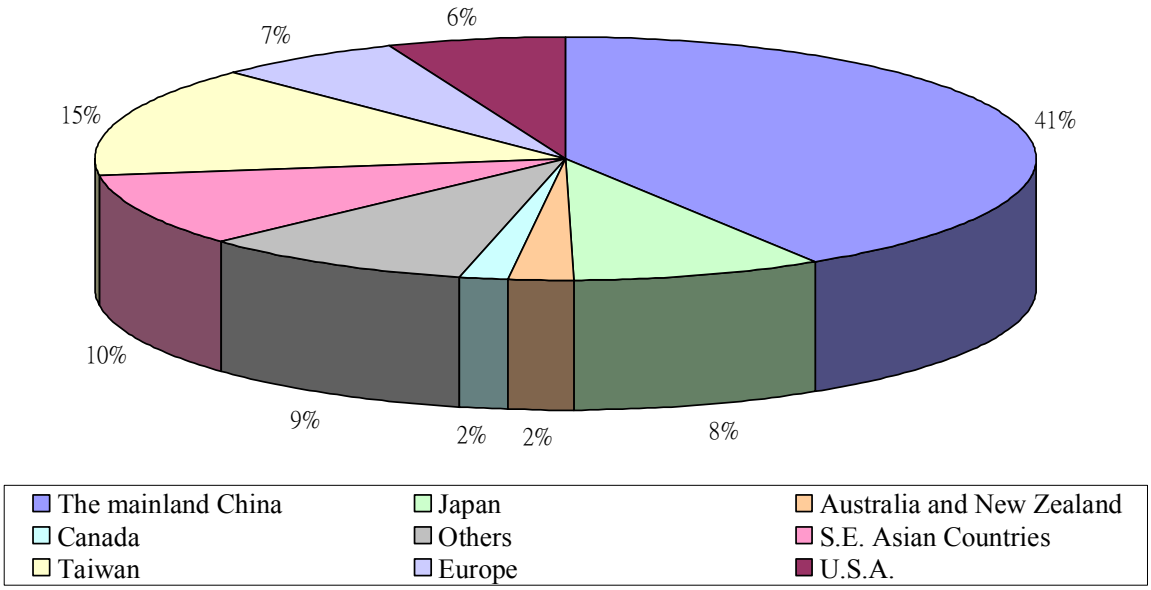


Figure 4.16 Origins of Visitors of Hong Kong (in 2002)

Source: Census and Statistics Department (2003c)[58]

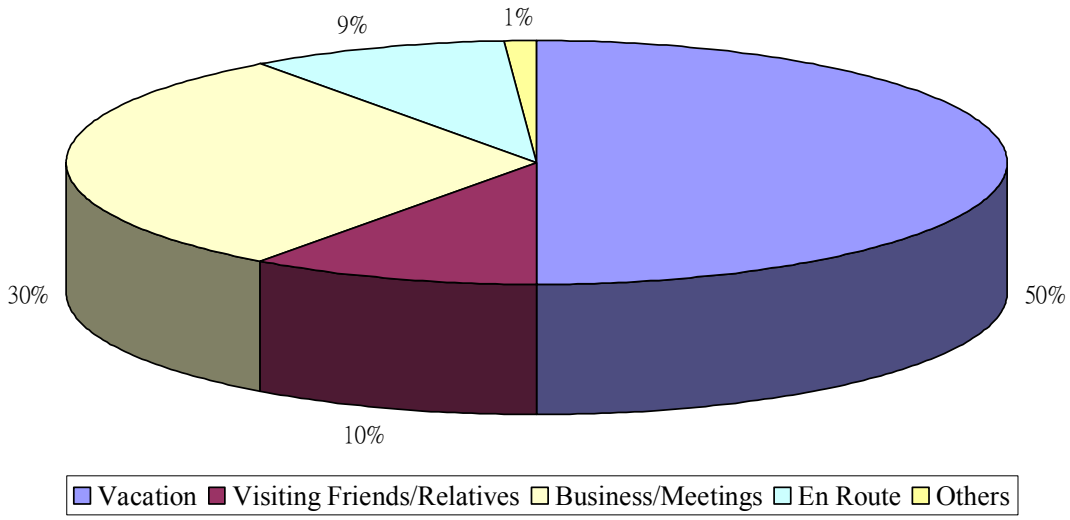


Figure 4.17 Purpose of Visit of Visitors in Hong Kong (in 2002)

Source: Hong Kong Tourism Board (2002)[59]

[58] Census and Statistics Department. (2003c). *Hong Kong Monthly Digest of Statistics, Oct 2003*. Hong Kong: Census and Statistics Department.

[59] Hong Kong Tourism Board. (2002). *Visitor Profile Report – 2001*. Hong Kong: Hong Kong Tourism Board.

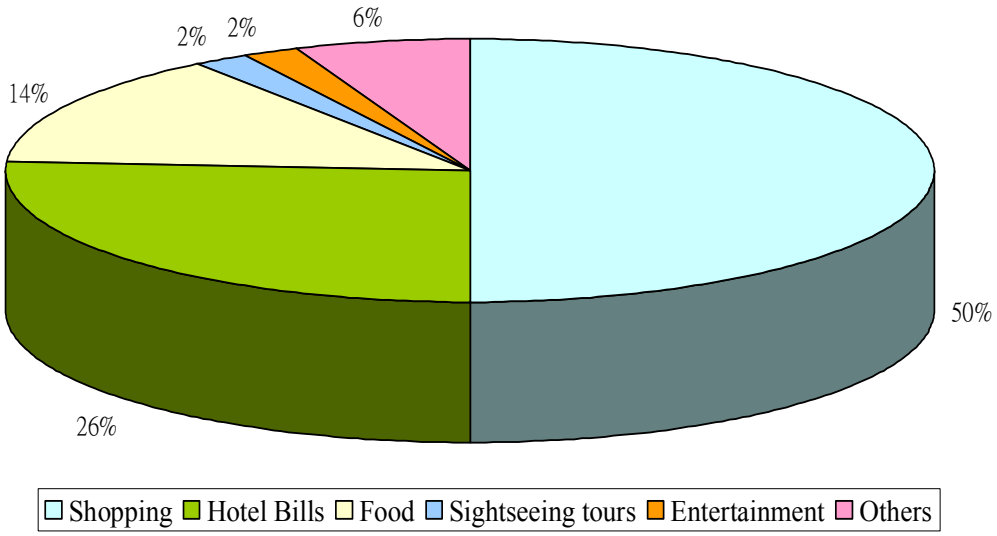


Figure 4.18 Expenditure Pattern of Visitors in Hong Kong (in 2002)

Source: Hong Kong Tourist Association (2003)[60]

[60] Hong Kong Tourist Association. (2003). *Tourism in Hong Kong – The Figures, 2003*. Hong Kong: Hong Kong Tourist Association.

Departure (DEPART)

The majority of retail sales is contributed by local residents in a territory.[61] Therefore, when they travel to other places abroad, the overall demand for goods and services in the local retail market will be significantly affected. This will in turn affect the occupation demand for retail space and hence its rents. Therefore, it is also important to consider the impact of departure of Hong Kong residents in this study.

Departure in Hong Kong

The number of Hong Kong resident departure has been increasing gradually over the period 1992-2002. In 2002, the number reached approximately 64.5 millions (see Figure 4.19). The increase in social and economic links with China has resulted in a remarkable increase in cross-boundary travel activities. In 2002, over 80 per cent of the total departing residents travelled to China. (see Table 4.6) This has an important influence on local retail market since shopping in China, particularly in Guangzhou and Shenzhen has been very popular. This leads to competition between retailers in Hong Kong and China, which will in turn influence the retail rents in Hong Kong.

[61] The majority of retail sales in Hong Kong is contributed by local residents, as it has been shown above that only about 20% of the total retail sales value (in 2002) in Hong Kong was contributed by incoming visitors.

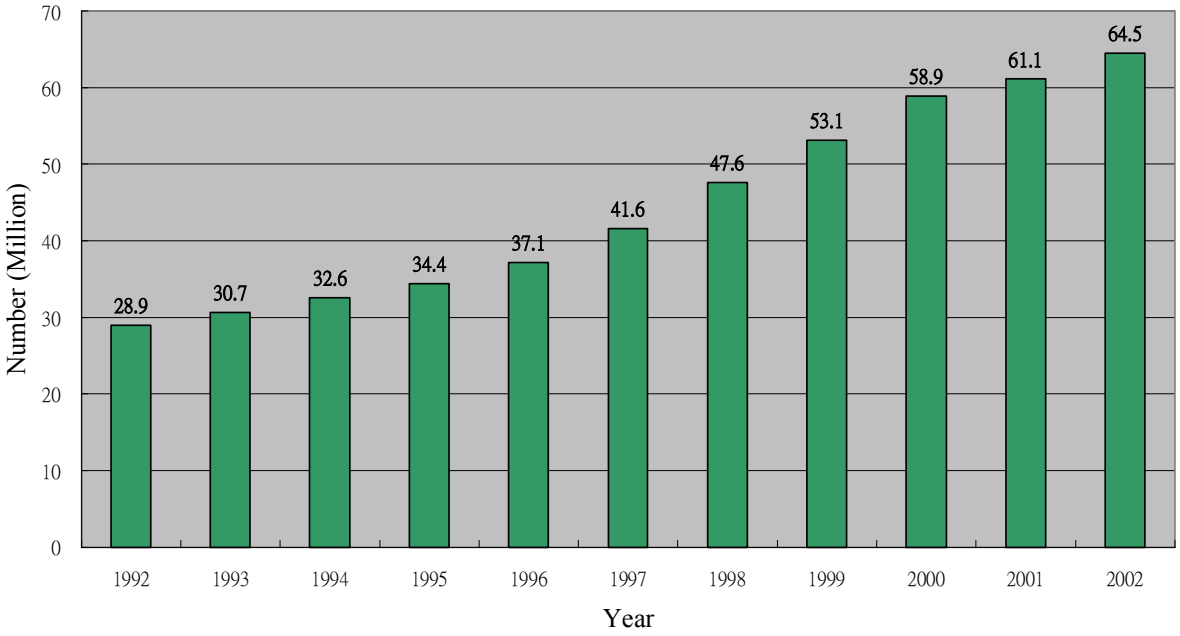


Figure 4.19 Number of Hong Kong Resident Departures

Source: Financial Services Bureau (1992-2003)[62]

Destination	Percentage of Total Number of Departures
The mainland China	86.22%
Macau	6.48%
Thailand	0.88%
Taiwan	0.83%
Japan	0.81%
Singapore	0.49%
Philippines	0.42%
U.S.A.	0.29%
Australia and New Zealand	0.35%
Canada	0.25%
U.K.	0.30%
Germany	0.06%
Others	2.62%

Table 4.6 Destinations of Hong Kong Resident Departures (in 2002)

Source: Census and Statistics Department (2003c)[63]

[62] Financial Services Bureau. (1992-2003). *Economic Background*. Hong Kong: Govt. Printer.
[63] Census and Statistics Department. (2003c). Hong Kong Monthly Digest of Statistics, June 2003. Hong Kong: Census and Statistics Department.

Supply-side Variable

Supply of Retail Space (NEW)

According to the law of supply and demand, the determination of retail rents is subject to the joint forces of demand and supply. If the retail space supply is limited, retailers will compete for it by bidding up the rents. An increase in supply provides more choices to retailers that can fully or partly satisfy their occupation demand. This will have a dampening effect on the growth of retail rents. On the other hand, oversupply leads to vacancy of some retail space and will have a negative effect on its rents. Key *et al.* (1994 cited Tsolacos, 1995, p.520), Benjamin *et al.* (1996) Robertson and Jones (1998) justify that retail space supply has a significant impact on retail rents.

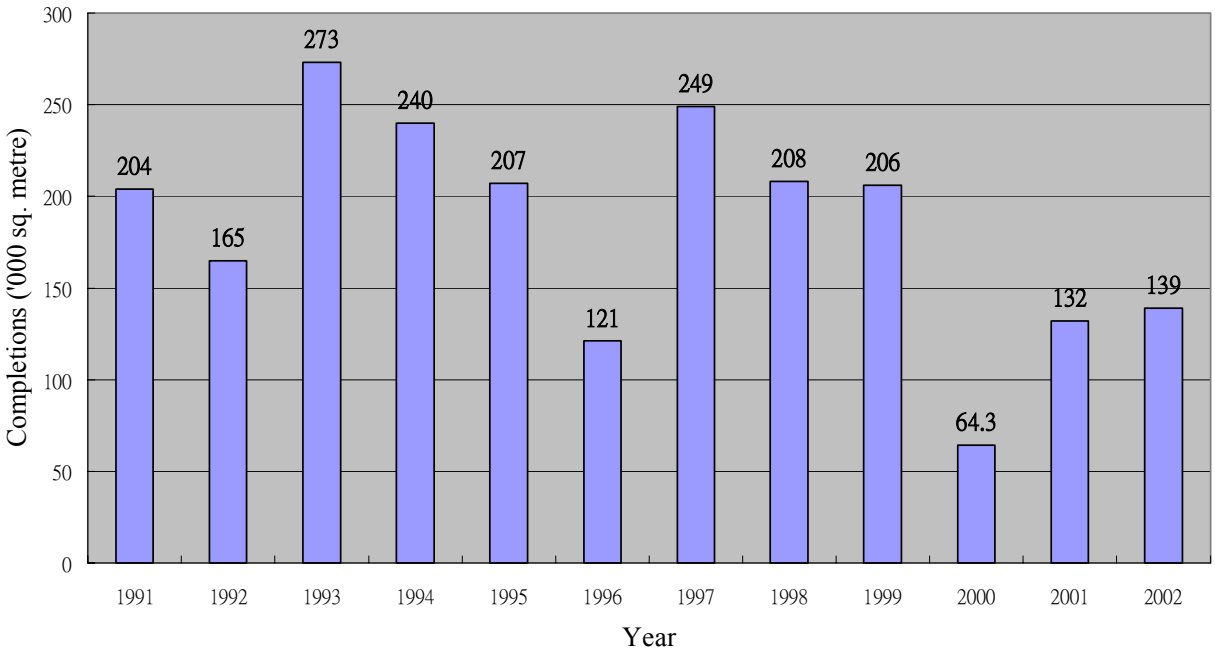
However, Leishman (2003) suggests that there is a time delay for rents to respond to changes in supply because the property market is imperfect with poor information flows and limited number of transactions. The impact of supply on retail rents is dependent on how effectively supply responds to demand fluctuations. As discussed in Section 2.2.2, the supply of retail space is inelastic in the short run, so the short-term rental values are primarily demand-determined. Moreover, the rent surplus theory assigns less importance to the supply-side influences. These suggest that supply is insignificant in retail rent determination and it is evidenced by the studies of Hetherington (1988) and Tsolacos (1995).

Despite the possible insignificance of supply-side factor, supply-side variables

should be incorporated since this study is modelled on the demand-supply framework. It is noted that existing retail stock and/or new retail building output is commonly used for capturing the supply-side effects on retail rents.

Supply of Retail Space in Hong Kong

The supply of retail space in Hong Kong fluctuates rapidly over the years. There is no general trend. However, it is observed that the extremely low supply of 643,000 square meters in 2000 was due to the serious attack of retail business by the Asian Financial Crisis in 1997. (see Figure 4.20) This implies that the supply of new retail space fluctuates with the pattern of the demand for retail products and hence retail space, but subject to a time lag.



Notes: The figures refer to the completions of "Other commercial premises". These include mainly shopping arcades in residential and commercial development and premises designed or adapted for commercial use other than offices. Carparking space is excluded. These figures are regarded as the supply of new shopping space by Financial Services Bureau (1992-2003)[64]

Figure 4.20 Completions of New Shopping Space in Hong Kong

Source: Financial Services Bureau (1992-2003)[65]

4.4 Expected Signs of Coefficients of Independent Variables

The independent variables have been carefully selected after reviewing previous literature and the specific situations in Hong Kong. They are all expected to be statistically significant in the result. Before starting the regression analysis, their expected signs of coefficients are discussed in this Section. The expected signs are determined based on the expectations on their impacts, either positive or negative, on

[64] Financial Services Bureau. (1992-2003). *Economic Background*. Hong Kong: Govt. Printer.
[65] *Ibid.*

the average retail rent in Hong Kong. The expected signs of all independent variables are summarized in Table 4.7.

Gross Domestic Product (GDP)

As discussed, there is a direct relationship between GDP and the economy. An increase in GDP signifies economic growth and improvement in general wealth and hence income levels of local people. (Liow, 2000; Hui and Lui, 2002) Higher economic growth and income level will in turn stimulate the demand for various goods and services, including those in the retail industry. Since retail space is a business property i.e. a factor of production in the retail business, a higher demand for retail goods and services will lead to a higher demand for retail space. This will in turn bid up the retail rental level, given that the supply of retail space is inelastic in the short run.

The positive relationship between GDP and retail space is also demonstrated by the results of some previous overseas studies. For example, in a European study by D'Arcy *et al.* (1997a), changes in lagged GDP are shown to have significant and positive correlations with retail rents. In the same way, Tsolacos (1995) shows that GDP lagged five and seven quarters respectively have positive signs of partial coefficients in the retail rent model in the U.K.. These illustrate that GDP generally

has a positive influence on retail rents and is expected to have a positive sign of partial coefficient in the result.

Retail Sales (SALE)

Retail sales value is an indicator of retailers' revenue and can act as a proxy for their turnover. In light of the rent surplus theory, retailers assess the maximum rents they can afford based on their turnover. Therefore, an increase in retail sales value leads to higher affordable retail rents. On the other hand, retail sales value also measures the demand for retail goods and services. Under the concepts of demand-supply interaction and derived demand, higher retail sales value encourages retailers to expand their business and new players to start retail business, and it leads to a higher demand for retail space. Consequently, retail rents are driven up.

The positive relationship between retail sales value and retail rents is demonstrated by a number of foreign studies. For example, D'Arcy *et al.* (1997a) and Hetherington (1988) demonstrate the significant positive impacts of retail sales on retail rents. It is therefore justified that retail sales value has a positive impact on retail rents at an aggregate level and SALE is expected to have a positive sign.

Mortgage Rate (MORT)

Since the sales market and the rental market are substitutes, an increased demand for

ownership reduces the demand for rental premises, and vice versa. With reference to the retail property market, an increase in mortgage rate raises the cost of capital for potential buyers, who will then switch to rent the premises for conducting their retail business. This leads to higher demand for rental space and hence its rents.

As shown that mortgage rates and interest rates are closely related and they often fluctuate with inflation rates, increase in mortgage rates may be perceived by people as an indicator of better investment returns and economic conditions. These stimulate them to consume more retail goods and services, thereby leading to a higher demand for retail space and thus its rents.

Increasing mortgage rate also increases monthly mortgage installments and hence the financial burden of existing owners who have mortgaged their retail space. If they cannot afford to pay the installments, they will sell their premises and rent the same or another, assuming that they want to continue their business. As a result, the demand in the rental market increases and this bids up the rents.

Moreover, most retail space in Hong Kong is owned by either individual landlords or developers for leasing to retailers. An increase in mortgage rate increases the financial burden of the owners who have mortgaged their premises. In order to make their investment more profitable, they will raise the rents against their tenants during rent reviews or new lease negotiations.

The above situations postulate that mortgage rates have positive impacts on retail rents. This is also supported by the empirical study of Dobson and Goddard (1992), which identifies the positive relationship between the real interest rates and the rents of retail property. Therefore, the expected sign of MORT is positive.

Inflation (CPI)

It has been illustrated that inflation index can reflect a territory's general economic conditions. Therefore, a higher inflation index indicates better economic performance, which stimulates people to purchase more retail goods and services. This in turn leads to expansion and establishment of different retail business. Therefore, the occupation demand for retail space is higher and the aggregate retail rent is driven up.

The positive impact of inflation on retail rents can also be explained by the argument that inflation is positively related to interest rates. Inflation often increases the interest rates charged by financial institutions on loans or mortgages to buyers of retail space. As explained, mortgage rates are expected to have positive impact on retail rents. It is therefore deduced that inflation has an indirect positive influence on retail rents. As a result, it is expected that the sign of coefficient of CPI is positive.

Income (INCOME)

An increase in the aggregate income level of a place enhances people's purchasing power. Moreover, it is expected that a sizable share of Hong Kong people's income can be spent in the retail market. Therefore, higher aggregate income increases the demand for retail goods and services, thereby increasing the turnover of retailers. This stimulates expansion or new establishment of retail business. This results in higher occupation demand for retail space for business operation. Consequently, the average rents of retail space are driven up. INCOME is therefore expected to have a positive sign in the result.

Unemployment (UNEM)

As shown, an increase in unemployment rate is expected to lower the aggregate purchasing power of the population due to lower aggregate income. This leads to contraction in the demand for goods and services. Therefore, retail activity becomes less active and the demand for retail space is lowered, exerting a downward pressure on retail rents. Moreover, higher unemployment rate is perceived by people as a sign of weaker economy. Therefore, they are inclined to save money and demand less retail goods and services. Similarly, a negative impact of unemployment rate is exerted on retail rents.

Dobson and Goddard (1992) incorporates unemployment rate in their rent

determination model for different commercial properties. The result shows that the unemployment variable is negatively signed for shops. With the support of previous literature, the sign of UNEM is anticipated to be negative in the result.

Stock Market Performance (HSI)

As indicated by the high stock exchange turnover[66], the stock market plays an important role in Hong Kong. Many people in Hong Kong invest in the stock market and part of their income is therefore tied to the stock market performance. When it performs well, people earn more money and will spend more in the retail market, thereby boosting the demand for and rents of retail space.

On the other hand, stock market performance is often perceived as an indicator of the general economic conditions. Therefore, when it performs better, it has a positive influence on people's confidence on the economy and hence their intention to purchase retail products. Again, this will have a subsequent positive effect on retail rents. Therefore, HSI is expected to have a positive sign in the result.

Visitors (VISIT)

Since visitors spend much on shopping items and food in the retail market, an increase

[66] The stock exchange turnover was HK$1,643.1billion in 2002 in the Hong Kong stock market. Source: Census and Statistics Department. (2003b). *A Graphic Guide on Hong Kong's Development, 1967-2002*. Hong Kong: Census and Statistics Department

in number of visitors implies higher retail turnover. This in turn leads to higher demand for retail space for expansion or establishment of retail business. Consequently, the retail rental level will be driven up. As a result, VISIT is expected to have a positive sign in the result.

Departure (DEPART)

As shown, the majority of retail sales is contributed by the demand arisen from local residents.[67] When more residents depart to other places, the local retail sales will be depressed because of fewer customers and hence the aggregate demand in the retail market. Furthermore, in the context of Hong Kong, over 80 per cent of the departures travel to China.[68] This leads to keen competition between retail products in Hong Kong and China, particularly in the boarder regions e.g. Guangzhou and Shenzhen, where the prices are comparatively lower. As people spend more in other places' retail markets, they will demand less in the local market when they return. This will subsequently lead to a drop in retail space demand and hence its rentals in Hong Kong. Therefore, it is anticipated that DEPART will have a negative sign in the result.

[67] As shown in Section 4.3, about 80% of the total retail sales value in Hong Kong was contributed by local people in 2002.
[68] See Table 4.6 in Section 4.3.

Supply of Retail Space (NEW)

The law of supply and demand postulates that an increase in the supply of retail space should have a negative effect on rents *ceterus paribus*. A shortage of retail space usually causes rentals to rise because of competition among retailers with occupation demand; while an oversupply of space may lead to a decline in rentals because of the higher vacancy rate and lowered competition. It is therefore expected that supply has a negative relationship with retail rents and will be negatively signed in the result.

VARIABLES IN INITIAL MODEL SPECIFICATION	DENOTED AS	PROXIED BY	EXPECTED SIGNS OF COEFFICIENTS
Dependent Variable			
Retail Rent	*RENT*	Retail Rental Index	N. A.
Independent / Explanatory Variable			
Demand-side Variable			
Gross Domestic Product	*GDP*	Gross Domestic Product	+
Retail Sales	*SALE*	Total Retail Sales Value Index	+
Mortgage Rate	*MORT*	Average Effective Mortgage Rate	+
Inflation	*CPI*	Consumer Price Index	+
Income	*INCOME*	Index of Payroll Per Person	+
Unemployment	*UNEM*	Unemployment Rate	−
Stock Market Performance	*HSI*	Hang Seng Index	+
Visitors	*VISIT*	Number of Incoming Visitors	+
Departure	*DEPART*	Number of Hong Kong Residents Travelling Abroad	−
Supply-side Variable			
Supply of Retail Space	*NEW*	New Completions of Retail Space	−

Table 4.7 Summary of Expected Signs of Coefficients of Independent Variables

4.5 Data Specifications

The ten explanatory variables selected will be tested for their significance in the retail rent determination in Hong Kong. Most of them cannot be measured directly due to unavailability of local data. They are measured by indirect indicators or proxies. As a result, the validity of the model results will be partly determined by the quality and reliability of these proxy data. The objective of this Section is to provide a detailed account of the data used for the empirical analysis. The period of data used in this study is defined in Section 4.5.1. The definitions, sources and necessary adjustments of the proxy data for each variable are described in Section 4.5.2.

4.5.1 Period of Data

The data used for this study is restricted to the period 1992-2002, totaling 11 years. It is the longest time period, for which full data sets are available for all variables. Quarterly data (from 1992 Q1 to 2002 Q4) are used because majority of the data are in quarterly figures. In order to obtain the complete data set, monthly figures of some variables will be adjusted to quarterly based. Since seasonal differences are used, the sample period becomes 1993-2002. With consideration of time lags up to eight quarters, 32 observations will be available for the empirical analysis.

4.5.2 Definitions and Sources of Data

Below is a detailed account of the definitions, sources and adjustments (if necessary) of the data for each variable. The reliability of data has important implication for the validity of the empirical findings. All the data employed in the empirical analysis is collected from various authoritative sources, most of which are government official publications. The published figures are verified to be clean and of high reliability. The definitions and sources of the data are summarized in Table 4.8.

Retail Rent (RENT)

The average retail rent in Hong Kong is measured by the quarterly Private Retail Rental Index (1989 = 100), which is compiled by the Rating and Valuation Department (R&V). The index is designed to measure rental changes with quality kept at a constant by making reference to rent divided by rateable value of the property. The index is derived from the rents negotiated during lease renewals and fresh lettings of retail premises.[69] (Rating and Valuation Department, 2004 website) Over the period of study, the indices are spread over two data series with different base years (1989 = 100 and 1999 = 100). The indices are standardized to the same

[69] Information is obtained from a variety of sources including notifications of fresh lettings made under the provisions of the Landlord and Tenant (Consolidation) Ordinance, requisitions issued under the provisions of the Rating Ordinance and the Government Rent (Assessment and Collection) Ordinance, letters from landlords and tenants and site visits made by staff of the R&V.

base year of 1989. The data is sourced from "*Hong Kong Property Review"* and *"Rental, Price and Supply Statistics For Major Property Categories"* published by the R&V.

Gross Domestic Product (GDP)

GDP by expenditure component at constant (2000) market prices, compiled by the Census and Statistics Department (C&S) are employed. Under the expenditure approach, GDP is compiled as the total final expenditure on goods and services (including private consumption expenditure, government consumption expenditure, gross domestic fixed capital formation, changes in inventories and exports of goods and services), less imports of goods and services. (Census and Statistics Department, 2004 website) The effect of price changes is removed from GDP at constant market prices taking 2000 as the base year. The quarterly data is obtained from the official website of the C&S.

Retail Sales (SALE)

Total Retail Sales Value Index (Oct 1999 – Sep 2000 = 100) is used to measure retail sales in Hong Kong. It is compiled by the C&S based on the results of the "Monthly Survey of Retail Sales". The value index measures the changes in value terms and

intends to measure the sales receipts of goods sold by local retail establishments, for gauging the short-term business performance of the local retail sector. (Census and Statistics Department, 2004 website) It is regarded by the C&S as a comprehensive indicator of the overall consumer spending in Hong Kong. The quarterly data is available from the official website of the C&S.

Mortgage Rate (MORT)

The raw data used to proxy mortgage rate is the Average Effective Mortgage Rate charged on new mortgages by the principal banks in Hong Kong. The rate refers to the modal value, representing the rate most commonly charged amongst the banks. However, owing to the competition among banks and differences in the property types, the actual mortgage rates charged may differ from the average rate. The rate over the period 1991-1994 is in monthly figures. Quarterly figures are then obtained by averaging of the corresponding monthly data. The data is sourced from *"Economic Background"* published by the Financial Services Bureau.

Inflation (CPI)

The Composite Consumer Price Index (Composite CPI) (Oct 1999 – Sep 2000 = 100), compiled by the C&S, is used as a measure of inflation. CPI measures the changes

over time in the price level of consumer goods and services generally purchased by households. The year-on-year rate of change in CPI is widely used as an indicator of inflation affecting consumers. The Composite CPI is a more accurate indicator for inflation as it is derived from the overall expenditure pattern of all households, reflecting the impact of consumer price changes on households as a whole. (Census and Statistics Department, 2004 website) The quarterly Composite CPI data are collected from the C&S official website and *"Economic Report"* published by the HKSAR Government Printer.

Income (INCOME)

The aggregate income is measured by the Real Index of Payroll Per Person engaged in all selected industry sectors (1999 Q1 = 100), which is compiled by the C&S. The payroll covers wages and salaries, bonuses and gratuities, commissions, allowances and cash payments in other forms paid directly to employees. The real index indicates changes in the purchasing power of labour earnings. (Census and Statistics Department, 2004 website) The selected industry sectors cover Manufacturing; Wholesale, Retail, Import/Export Trades, Restaurants and Hotels; Transport Services; Financing, Insurance, Real Estate and Business Services; and Personal Services. The quarterly index is sourced from the official website of the C&S.

Unemployment (UNEM)

The level of unemployment is measured by the Seasonally Adjusted Unemployment Rate, which is compiled by the C&S. The unemployment rate refers to the proportion of unemployed persons, who are currently available for and seeking a job, to the total labour force. Seasonally adjusted unemployment rates are suitable for making comparison over time as the seasonal effects have been addressed by some adjustments. (Census and Statistics Department, 2004 website) Quarterly data is collected from the C&S official website.

Stock Market Performance (HSI)

Hang Seng Index (HSI) (31/7/1964=100), compiled by the HSI Services Ltd, is a widely accepted indicator of the stock market performance in Hong Kong. It is constructed from 33 constituent stocks in Hong Kong. The average monthly HSI is available from *"Hang Seng Indexes"* published by the HSI Services Ltd and *"Stock Exchange Fact Book"* published by the Stock Exchange of Hong Kong. Quarterly HSI is then computed by averaging the data of the corresponding three consecutive months.[70]

[70] The average monthly HSI is multiplied by the number of transaction days in each month to arrive at a total monthly figure. The sum of total monthly figures of the three consecutive months in a quarter is divided by the total number of transaction days in the three months to arrive at the quarterly average HSI.

Visitors (VISIT)

The Number of Incoming Visitors, compiled by the Hong Kong Tourism Board, is used to measure the Visitor variable. The figures measure the numbers of visitor arrivals from all different countries. Quarterly figures are obtained from *"Economic Background"* published by the Financial Services Bureau.

Departure (DEPART)

The Departure variable is proxied by the Number of Hong Kong Residents Travelling Abroad, which is compiled by the Immigration Department. Figures from 1996 onwards also include visitors other than Macau residents, coming to Hong Kong via Macau. The figures are obtained from *"Economic Background"* published by the Financial Services Bureau.

Supply of Retail Space (NEW)

Completions of New "Other Commercial Premises", compiled by the C&S are used to proxy the supply of retail space. The "Other Commercial Premises" mainly includes retail space, but also covers premises designed or adapted for commercial use other than offices, in the nature of non-domestic space on the podium floors of tenement apartment/commercial buildings. Carparking space is excluded. (Financial Services

Bureau, 1992-2003) However, the data cannot measure the supply of existing stock of retail space. Therefore, it is not a comprehensive measure of the retail space supply. Nevertheless, data of the total supply including both new supply and existing stock are not available. The quarterly data is obtained from *"Economic Background"* published by the Financial Services Bureau.

VARIABLES IN INITIAL MODEL SPECIFICATION	DEFINITIONS OF PROXIES	SOURCES OF PROXIES
Dependent Variable		
Retail Rent (RENT)	Private Retail Rental Index (1989 = 100)	- Hong Kong Property Review - Rental, Price and Supply Statistics For Major Property Categories
Independent / Explanatory Variable		
Demand-side Variable		
Gross Domestic Product (GDP)	GDP at Constant (2000) Market Prices (by expenditure component)	- C&S website
Retail Sales (SALE)	Total Retail Sales Value Index (Oct 1999 – Sep 2000 = 100)	- C&S website
Mortgage Rate (MORT)	Average Effective Mortgage Rate (charged on new mortgages by principal banks)	- Economic Background
Inflation (CPI)	Composite Consumer Price Index (Oct 1999 – Sep 2000 = 100)	- Economic Report - C&S website
Income (INCOME)	Real Index of Payroll Per Person engaged in all selected industry sectors (1999 Q1 = 100)	- C&S website
Unemployment (UNEM)	Seasonally Adjusted Unemployment Rate	- C&S website
Stock Market Performance (HSI)	Hang Seng Index (31/7/1964=100)	- Hang Seng Indexes - Stock Exchange Fact Book
Visitors (VISIT)	Number of Incoming Visitors	- Economic Background
Departure (DEPART)	Number of Hong Kong Residents Travelling Abroad	- Economic Background
Supply-side Variable		
Supply of Retail Space (NEW)	Completions of New "Other Commercial Premises"	- Economic Background

Table 4.8 Summary of Definitions and Sources of Data

CHAPTER 5 EMPIRICAL RESULTS AND ANALYSIS

5.1 Introduction

To this end, the seasonal difference of Retail Rent (RENT) has been regressed on the seasonal differences of ten independent variables over the period 1992-2002. Ordinary Least Squares regression with stepwise function has been employed to arrive at the best final model specification with the insignificant variables being removed. The purpose of this Chapter is to provide a comprehensive insight into the empirical results. Section 5.2 will illustrate the detailed steps in arriving at the final estimation equation and summarize the statistical results. Section 5.3 will be a comprehensive analysis of the empirical results. Section 5.4 will illustrate the implications of findings from the results.

5.2 Empirical Results

From Section 4.2, the initial model specification of this study is:

$$\Delta RENT_t = a_0 + a_1 \Delta GDP_{t-k1} + a_2 \Delta SALE_{t-k2} + a_3 \Delta MORT_{t-k3} + a_4 \Delta CPI_{t-k4} + a_5 \Delta INCOME_{t-k5} + a_6 \Delta UNEM_{t-k6} + a_7 \Delta HSI_{t-k7} + a_8 \Delta VISIT_{t-k8} + a_9 \Delta DEPART_{t-k9} + a_{10} \Delta NEW_{t-k10} + \varepsilon_t \quad (3)$$

The starting point of the empirical analysis is to determine the best time lag structure of each independent variable. The correlations between ΔRENT and the changes of

each independent variable lagged 0-8 quarters are estimated using the Pearson Test. The summary of the correlations is presented in Table 5.1. It is shown that, except ΔMORT and ΔNEW, all independent variables are significantly correlated (at the 0.05 level) with ΔRENT in terms of some of their lagged/contemporaneous changes. As suggested in Section 3.3, each significant lagged/contemporaneous change of one variable was combined with each of the others into numerous combinations. For ΔMORT and ΔNEW, despite their insignificant correlations, each of their changes lagged 0-8 quarters was used for the combinations. Then ΔRENT was regressed on each combination using the OLS technique with stepwise function to estimate the final equation with the highest explanatory power.

The best result was achieved by incorporating contemporaneous $\Delta SALE_t$, ΔCPI_t and $\Delta UNEM_t$; $\Delta INCOME_{t-1}$ and $\Delta DEPART_{t-1}$ (both lagged 1 quarter); ΔGDP_{t-2} and ΔHSI_{t-2} (both lagged 2 quarters); $\Delta VISIT_{t-4}$ (lagged 4 quarters); $\Delta MORT_{t-5}$ (lagged 5 quarters); and ΔNEW_{t-7} (lagged 7 quarters) as independent variables. The stepwise procedure removed the insignificant variables at the 0.05 level and Equation (3) was refined to the following estimated model specification:

$$\Delta RENT_t = a_0 + a_1\Delta SALE_t + a_2\Delta MORT_{t-5} + a_3\Delta CPI_t + a_4\Delta UNEM_t + a_5\Delta HSI_{t-2} + a_6\Delta DEPART_{t-1} + u_t \quad (4)$$

where u_t is the stochastic error term of the estimated model.

The statistical results of the estimated specification are presented in Table 5.2.

Independent Variables	Lags of Independent Variables (quarter)	0	1	2	3	4	5	6	7	8
GDP	**Correlation**	0.417**	0.503**	0.526**	0.477**	0.357**	0.201	0.055	-0.060	-0.137
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.001	0.079	0.638	0.607	0.243
SALE	**Correlation**	-0.318**	-0.119	0.070	0.215	0.268*	0.253*	0.193	0.103	0.019
	Sig. (2-tailed)	0.007	0.332	0.572	0.081	0.030	0.042	0.126	0.424	0.884
MORT	**Correlation**	0.163	-0.022	-0.177	-0.256	-0.266	-0.211	-0.109	0.018	0.165
	Sig. (2-tailed)	0.284	0.884	0.249	0.098	0.089	0.186	0.502	0.915	0.323
CPI	**Correlation**	0.635**	0.532**	0.440**	0.360**	0.309**	0.280*	0.269*	0.265*	0.263*
	Sig. (2-tailed)	0.000	0.000	0.000	0.001	0.006	0.014	0.019	0.021	0.024
INCOME	**Correlation**	0.192	0.267*	0.245*	0.232*	0.147	0.071	-0.006	-0.058	-0.046
	Sig. (2-tailed)	0.084	0.016	0.029	0.040	0.200	0.541	0.956	0.621	0.699
UNEM	**Correlation**	-0.548**	-0.585**	-0.533**	-0.413**	-0.248*	-0.067	0.062	0.138	0.141
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.029	0.561	0.592	0.238	0.231
HSI	**Correlation**	0.401**	0.608**	0.722**	0.692**	0.539**	0.338*	0.126	-0.050	-0.169
	Sig. (2-tailed)	0.007	0.000	0.000	0.000	0.000	0.031	0.440	0.763	0.310
VISIT	**Correlation**	-0.107	0.093	0.314	0.521**	0.623**	0.594**	0.442**	0.198	-0.085
	Sig. (2-tailed)	0.536	0.590	0.062	0.001	0.000	0.000	0.007	0.255	0.632
DEPART	**Correlation**	-0.533**	-0.539**	-0.525**	-0.502**	-0.474**	-0.416**	-0.369*	-0.296	-0.237
	Sig. (2-tailed)	0.000	0.000	0.000	0.001	0.001	0.005	0.014	0.054	0.131
NEW	**Correlation**	0.069	0.037	0.063	0.103	0.040	0.024	-0.088	-0.165	-0.119
	Sig. (2-tailed)	0.650	0.811	0.684	0.511	0.800	0.884	0.588	0.316	0.477

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Model Summary			
R-squared	0.9405		
Adjusted R-squared	0.9268		
F-statistic	68.4879		
No. of observations	32 (after seasonal change and maximum lag adjustments)		
No. of excluded variables from the estimated equation (insignificant at 0.05 level)	4 (include ΔGDP_{t-2}, $\Delta INCOME_{t-1}$, $\Delta VISIT_{t-4}$ and ΔNEW_{t-7})		
No. of significant variables in the estimated equation (significant at 0.05 level)	6 (shown below)		
Significant Variables in the Estimated Equation	**Partial Coefficients**	**t-statistics**	**p-values**
$\Delta SALE_t$	0.1647	4.5251	0.0001
$\Delta MORT_{t-5}$	-4.8046	-3.8947	0.0006
ΔCPI_t	1.3335	-6.9701	0.0000
$\Delta UNEM_t$	-3.7680	6.7013	0.0000
ΔHSI_{t-2}	0.0019	4.7744	0.0001
$\Delta DEPART_{t-1}$	-0.000007	-4.0457	0.0004

Table 5.2 Statistical Results of OLS Regression with Stepwise Function[71]

[71] The detailed statistical results of the stepwise regression analysis are shown in Appendix II.

The specification has a high explanatory power as reflected by the high adjusted R-squared of 0.9268. The F-statistic of 68.4879 strongly rejects the null hypothesis that all the partial coefficients are equal to zero. ΔGDP_{t-2}, $\Delta INCOME_{t-1}$, $\Delta VISIT_{t-4}$ and ΔNEW_{t-7} are insignificant at the 0.05 level and excluded from the final specification. The remaining six independent variables include $\Delta SALE_t$, $\Delta MORT_{t-5}$, ΔCPI_t, $\Delta UNEM_t$, ΔHSI_{t-2} and $\Delta DEPART_{t-1}$. They are all significant at the 0.01 level (as illustrated by their p-values). With the exception of $\Delta MORT_{t-5}$, all have the expected signs of coefficients. (see Table 5.2) A detailed analysis of the empirical results is provided in Section 5.3.

Finally, a number of diagnostic tests were performed to address the possible problems associated with the estimated model. The test results are summarized as follows.

Test for Auto-correlation

As this study involves the use of time series data, error terms of the observations may be correlated i.e. auto-correlation may occur and violate the assumption of the OLS regression. The Lagrange Multiplier Test was performed to test for auto-correlation. The result shows that the estimated model does not have autocorrelation problem. The

detailed test procedures and results are presented in Appendix III.

Test for Heteroscedasticity

The problem of heteroscedasticity arises when the model violate the assumption of the OLS regression that all error terms have the same variance. (Eastman, 1984) White's test was performed. The estimated value of R-squared of 0.0662 is much smaller than the critical value of 12.5916.[72] It concludes that there is no heteroscedasticity in the model.

Test for Multicollinearity

Multicollinearity arises when two or more independent variables in an equation are highly correlated and this violates the assumption of the OLS regression. (Eastman, 1984) Since most demand-side variables used in this study are influenced by broad economic trends, there may be close correlations among them. In order to minimize the chance of multicollinearity arising from trended data, seasonal differences of all variables had been used. A zero-order correlation matrix of the six independent variables in the equation was constructed using the Pearson Test. (see Table 5.3) Despite there is no theoretical guidance on the level of correlation that leads to

[72] The critical value in the Chi-squared distribution table for degrees of freedom (df) = 6 and level of significane (α) = 0.05 is 12.5916. (Chi-squared distribution table is shown in Appendix IV)

multicollinearitiy, the simple correlation coefficient of -0.829 between $\Delta UNEM_t$ and ΔHSI_{t-2} is quite high. However, when either or both of them were removed or replaced by other lagged data series, the adjusted R-squared dropped significantly and many other variables became insignificant. Therefore, this problem was only addressed but not solved.

Significant Variables in the Estimated Equation		$\Delta SALE_t$	ΔCPI_t	$\Delta UNEM_t$	ΔHSI_{t-2}	$\Delta MORT_{t-5}$	$\Delta DEPART_{t-1}$
$\Delta SALE_t$	Correlation	1	-.147	.338**	-.451**	.452**	-.105
	Sig.(2-tailed)	.	.221	.004	.002	.003	.496
ΔCPI_t	Pearson	-.147	1	-.032	.167	.271	-.535**
	Sig. (2-tailed)	.221	.	.776	.279	.079	.000
$\Delta UNEM_t$	Pearson	.338**	-.032	1	-.829**	.093	.119
	Sig. (2-tailed)	.004	.776	.	.000	.563	.441
ΔHSI_{t-2}	Pearson	-.451**	.167	-.829**	1	-.050	-.015
	Sig. (2-tailed)	.002	.279	.000	.	.756	.925
$\Delta MORT_{t-5}$	Pearson	.452**	.271	.093	-.050	1	-.040
	Sig. (2-tailed)	.003	.079	.563	.756	.	.818
$\Delta DEPART_{t-1}$	Pearson	-.105	-.535**	.119	-.015	-.040	1
	Sig. (2-tailed)	.496	.000	.441	.925	.818	.

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.3 Zero-order Correlation Matrix of Independent Variables

5.3 Analysis of Empirical Results

This section attempts to examine and explain the impacts of the major determinants of retail rents in Hong Kong. From the empirical results, an unexpected outcome is the complete insignificance (at the 0.05 level) of the changes of GDP (ΔGDP), Income (ΔINCOME), Visitors (ΔVISIT) and Supply of New Retail Space (ΔNEW) in the retail rent determination in Hong Kong. Section 5.3.1 proposes explanations for the exclusion of each of them from the final specification. The remaining six explanatory variables are significant determinants of retail rents at the macroeconomic level. Section 5.3.2 analyzes the impacts of these determinants on the average retail rent in terms of the signs of their partial coefficients and the time lag structures. Their relative degrees of influences on retail rents are also be examined by comparing the absolute values of their partial coefficients.

5.3.1 Excluded Variables

Gross Domestic Product (ΔGDP)

In contrast to the previous findings that GDP is a significant macro-economic determinant of property values, change of it is found to be have insignificant impact on retail rent change (ΔRENT). This anomaly may be explained by the fact that most people in Hong Kong may not notice the changes of GDP. Compared with other

factors such as unemployment rate, mortgage rate and stock market performance, GDP figures are less frequently announced in various media to the general public. Although GDP is a good measure of the general economy, people may not respond to its changes and adjust their demand for retail goods and services accordingly. Consequently, the demand for retail space and hence its rents may not be affected.

Furthermore, it is the landlords who adjust the rentals of their retail space. During rent reviews, they seldom make reference to the GDP figures, but to other micro-sense information that are more readily accessible e.g. interest rates, retail sales statistics or even performance of the residential property market. These may contradict the contention of previous studies that GDP is an important retail rent determinant.

Income (ΔINCOME)

The change of aggregate income is also found to be insignificant in this study. It is noted that the purchasing power of a person is determined by his disposable income, after the deduction of tax or other debt liabilities. Moreover, the demand for retail goods and services depends specifically on the person's income, which is disposable in the retail market i.e. after the deduction of expenditures on other investment, housing, education, transport, etc. This means the demand depends on the person's

expenditure pattern. In this study, the Income variable is measured by the change in the indices of payroll per person. However, a high aggregate income of a territory does not necessarily lead to a high demand for retail products and thus retail space. The actual aggregate demand for retail products should be proxied by the total income disposable in the retail market or alternatively the total value of expenditure on all retail goods and services. However, such data is not publicly available in Hong Kong.

In addition, the published figures of the aggregate income i.e. payroll indices, may underestimate the true aggregate income because some people fail to report all their earnings. Therefore, a low income level figure may not necessarily lead to a low aggregate purchasing power. Alternatively, the purchasing power may increase and stimulate retail sales. As a result, retail rents may not adjust in response to fluctuations of the income figures. The existence of unreported income may explain partially the insignificance of the Income variable in the result.

Visitors (ΔVISIT)

Despite the fact that Hong Kong's retail sales is partly contributed by visitors' spending in local retail market, the Visitor variable (proxied by the number of incoming visitors) has insignificant impact on the overall retail rents. This may be explained by the fact that only about 20 per cent of the total retail sales in Hong Kong

is contributed by visitors[73]. Therefore, spending of visitors may have little influence on the overall demand for retail goods and services. Moreover, most visitors only stay for an average of 3 days[74] in Hong Kong. The relatively short stays of visitors mean they only have limited time for shopping. In addition, only an average of 50 per cent of the visitors come to Hong Kong for vacation, the others may only visit relatives or friends, do business or pass via Hong Kong to other places, and they do not intend to spend much on retail goods and services. Therefore, among the visitors, only the group of tourists is the largest contributor to retail sales in Hong Kong. Particularly, the tourist factor should be used as a demand-side variable in the retail rent determination model. Nevertheless, there is no publicly available data of tourists only.

Furthermore, the actual demands for retail products are determined by the aggregate spending power of visitors. This is in turn determined by both the number of incoming visitors and their per capita spending on retail products. However, in this study, ΔVISIT is only proxied by the number of incoming visitors. This may not provide a comprehensive measure of the total consumer expenditure and the demand of visitors in the local retail market. As a result, this may preclude the inclusion of the Visitor variable in the final specification.

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[73] In 2002, about 20% of total retail sales value in Hong Kong was contributed by incoming visitors. (Detailed figures are shown in Section 4.3)

[74] Source: Hong Kong Tourist Association. (1991-2003). *Tourism in Hong Kong – The Figures, 1991-2003*. Hong Kong: Hong Kong Tourist Association.

Supply of Retail Space (ΔNEW)

On the supply-side, the single variable measured by the new completions of retail space is shown to be insignificant. The possible insignificance of supply-side variable has been addressed in Section 4.3. This conforms to the contention put forward by some previous studies that the supply of retail space tends to be inelastic in the short run, and therefore retail rents are primarily demand-determined. Moreover, the rent surplus theory assigns less importance for the supply-side influence on retail rents, because it suggests that retailers assess the maximum rents they can afford based on their retail turnover. In the context of Hong Kong, it is also observed that the new supply of retail space is inelastic in the short run due to long planning time, institutional barriers e.g. complicated government approval procedures, long construction time, etc. This may justify that retail rents in Hong Kong are also mainly driven by demand-side factors, and support the insignificant influence of the Supply variable.

In addition, the proxy for the Supply variable is the new completions of retail space. It is only a partial measure of true supply, which comprises the supply of both existing retail space for relet and newly completed retail space for first-time letting. However, data on the former component is not available for this study. Besides, due to data unavailability, the variable is only measured by the figures of Completions of

New "Other Commercial Premises", which include mainly retail space.[75] There are no supply figures specifically for retail space only. Therefore, the supply-side measure may not fully represent the effects of supply in the retail rent determination and may lead to the insignificance of its variable in this study.

5.3.2 Significant Variables

Retail Sales ($\Delta SALE_t$)

Contemporaneous change of Retail Sales ($\Delta SALE_t$) is statistically significant in the retail rent determination. It has a partial coefficient of 0.1647. The effect of ΔSALE on retail rent involves no time delay. It implies that landlords take into account of the current retail sales performance during rent negotiations with tenants. On the other hand, its positive sign is consistent with the expectation and it supports the postulation that retail sales is a direct measure of retailers' turnover. Moreover, it can proxy the current demand for retail goods and services. Therefore, higher retail sales means higher demand for retail products and higher retail turnover. This subsequently results in a contemporaneous increase in retail rents.

[75] Completions of New "Other Commercial Premises" is compiled by the Rating and Valuation Department. Source: Financial Services Bureau. (1992-2003). *Economic Background*. Hong Kong: Govt. Printer.

Mortgage Rate ($\Delta MORT_{t-5}$)

Change of Mortgage Rate (ΔMORT) is found to be statistically significant in affecting retail rent. It is registered with a lag of five quarters indicating the delayed adjustment of retail rents in response to mortgage rate fluctuations. Among the six significant explanatory variables, it has the highest absolute value of -4.8046 for its partial coefficient. This implies that $\Delta MORT_{t-5}$ causes the most substantial change in ΔRENT. However, in contrast to the initial expectation, it is negatively signed, which suggests that an increase in mortgage rate leads to a decrease in the overall retail rents.

The unexpected sign of ΔMORT is firstly addressed. It is previously hypothesized that higher mortgage rate leads to higher cost of capital, which discourages retailers to purchase retail premises for operating their business. They then shift to rent the premises in order to save the high mortgage installments. This in turn leads to higher demand for retail space. A positive relationship is then expected between mortgage rates and retail rents. However, in Hong Kong, the majority of retail space (including street shops and shopping centre space) is owned by developers or individual landlords for letting. Most retailers rent the premises for conducting business. The argument of high capital cost arising from high mortgage rates is less applicable in Hong Kong. Therefore, mortgage rate may not necessarily affect retail

rents positively.

Another initial explanation for the positive relationship is that higher mortgage rate is perceived by people as an indicator of better economic performance. This in turn stimulates the aggregate demand for retail goods and services, and hence retail space. However, people may not have such perception and increase their spending accordingly. Therefore, there may not be positive impact of the rising mortgage rate on retail rents.

Moreover, the Mortgage Rate variable in this study is proxied by the average effective mortgage rate charged on new mortgages by principal banks. Due to competition amongst the banks, the actual rates charged by various banks may fluctuate from these average figures. The actual rates also depend on individual circumstances, such as the type of property to be mortgaged and mortgage repayment ability of the mortgagor. Furthermore, this proxy only measures the new mortgage rate and fails to represent the effect of mortgage rate on existing mortgagor. This may not fully represent the ultimate effect of the variable on retail rents.

Conversely, the negative sign may be justified by the following explanations. In Hong Kong, about 50 per cent of domestic households live in the residential units, which they own. Among these owner-occupiers, about 50 per cent have mortgaged their premises. In 2001, the median monthly household mortgage payment was

HK$8,500, with about 43 per cent of households paying more than HK$10,000 each month for mortgages.[76] Increase in mortgage rate increases the financial burden of many home owners. They will therefore spend less on retail goods and services. This in turn leads to a lower demand for retail space and hence its rents.

On the supply side, the developments of new shopping space are capital-intensive projects for developers. The development decisions are most sensitive to the cost of capital relative to expected returns. Since the mortgage and interest rates move in the same direction, higher mortgage rate indicates higher interest rate i.e. higher cost of capital for developers. It may deter the developments and hence the supply of retail space. With an increasing demand, retail rents may be driven up. Although the supply-side factor is found to be insignificant, this may offer a mechanism to justify the negative impact of mortgage rate.

The lagged effect of ΔMORT on retail rents is then addressed. It is found that the negative impact of ΔMORT is exerted on ΔRENT after five quarters. It implies that landlords do not make reference to contemporaneous mortgage rates in adjusting retail rents. Moreover, it indicates the long frictional response of retail rents to changes of mortgage rate. For the effect of mortgage rate on the supply of retail space, such a

[76] In 2001, 50.8% of domestic households were owner-occupiers. Among them, 51.8% had mortgaged their premises. This amounted to 537,230 households. Source: Census and Statistics Department. (2001). *2001 Population Census Main Report – Volume 1.* Hong Kong: Census and Statistics Department.

long time lag is reasonable. Due to the inelasticity of supply in the short run, it usually takes more than a year for the changes in mortgage rate to develop into the supply market and ultimately affect the retail rents. On the other hand, the change in mortgage rate affects the financial burden of existing residential mortgagors instantly. The mortgagors will in response lower their demand for retail goods and services. The demand for retail space and thus its rents are expected to be ultimately influenced within a short period of time. The time lag of five quarters for ΔMORT seems to be too long, compared with that of ΔUNEM and ΔHSI, which are expected to have similar effects on the demand for retail products. The resulting long time lag may be explained by the exceptionally low mortgage rate figures towards the end of the data set i.e. over the period 2001-2002[77], so that ΔRENT may not be determined by the set of ΔMORT data that is contemporaneous or lagged by a short period.

Inflation (ΔCPI_t)

Contemporaneous change of Inflation (ΔCPI_t) has a partial coefficient of 1.3335, indicating that it has a positive impact on ΔRENT. Its significance shows that it has a contemporaneous effect in the retail rent determination within a period of one quarter. It confirms to the proposition that the average retail rent follows closely the trend of

[77] The average mortgage rates in 2001 (4.72%) and 2002 (2.61%) were substantially lower than the average rate in 1998 (10.79%). The trend and actual figures of Average Effective Mortgage Rate are shown in Figure 4.6 and Table 4.5 respectively in Section 4.3.

the general price level, as measured by CPI. This can be justified by the fact that property rent is one of the components in the compilation of CPI in Hong Kong.

Moreover, the result supports that inflation has positive impact on people's confidence on the general economy. This in turn encourages them to spend more in the retail market, thus boosting the demand for retail space. However, the result cannot be explained by the initial postulation that increased inflation leads to higher mortgage rate and hence positive impact on ΔRENT, because the result shows that ΔMORT has a negative impact on ΔRENT. Moreover, the effect of ΔMORT is registered with a lag of five quarters, in contrast to the contemporaneous effect of ΔCPI_t.

Unemployment ($\Delta UNEM_t$)

Contemporaneous change of Unemployment ($\Delta UNEM_t$), as measured by the unemployment rate, is shown to be statistically significant. It has a partial coefficient of -3.7680. Since ΔUNEM is not registered with any time lag, it implies that landlords, during the setting of rents, also make reference to the unemployment rate in the current period i.e. within three months. Moreover, the relatively large absolute value of -3.7680 shows that $\Delta UNEM_t$ causes quite a substantial change in ΔRENT, which is second to the effect of $\Delta MORT_{t-5}$.

As expected, it has a negative sign. It is consistent with the previous suggestion that higher unemployment rate reduces the aggregate income and hence the purchasing power of a territory. This in turn leads to lower aggregate demand for retail goods and services, and thus retail space. Moreover, it supports the fact that unemployment rate is an indicator of the general economy. A higher unemployment rate indicates poor economic performance. This in turn encourages people to save more money and spend less in the retail market. Again, this depresses the demand for retail space and hence its rents.

Stock Market Performance (ΔHSI_{t-2})

Change of Stock Market Performance has a partial coefficient of 0.0019 and is registered with a lag of two quarters. Despite it is statistically significant, ΔHSI_{t-2} has only little influence on $\Delta RENT$, as indicated by the small absolute value of its partial coefficient. Nevertheless, its significance in the retail rent determination is consistent with the previous findings that stock market plays an important role in Hong Kong. Many investors' income is tied to the stock market performance, which is measured by HSI. This in turn affects their purchasing power and demand for goods and services in the retail market. Furthermore, HSI is postulated to be a proxy for economic conditions. It is expected that a higher HSI indicates a better performing

economy, which stimulates the demand for retail products and thus retail space. The positive sign of ΔHSI_{t-2} in the result clearly confirms this positive relationship.

The lag of two quarters indicate that it takes about half a year for the effect of ΔHSI to develop into the retail market and subsequently affects ΔRENT. This time lag is reasonable since HSI is expected to have an indirect effect on retail rents. Moreover, landlords do not take into account of the current ΔHSI during rent reviews or new rent settings, as in contrast with ΔUNEM and ΔSALE, which have contemporaneous impacts on retail rents.

Departure ($\Delta DEPART_{t-1}$)

ΔDEPART, as measured by the number of residents traveling abroad, is shown to be statistically significant with a partial coefficient of -0.000007. It is registered with a lag of one quarter. The negative sign confirms the expectation that more resident departures lead to lower aggregate purchasing power in Hong Kong and hence depress the demand for retail products and thus retail space. The negative sign may also support the fact that there is keen competition between retail products in Hong Kong and China, in particular the Guangdong regions, where the prices are lower. As the majority (80 per cent)[78] of the departures destine to China, this may lead to lower

[78] See Table 4.6 in Section 4.3.

demand for retail goods and services in Hong Kong. Subsequently, there is a downward pressure on the average retail rent in Hong Kong.

However, $\Delta DEPART_{t-1}$ has a very low absolute value of coefficient. This implies that it has minimal impact on ΔRENT. ΔDEPART is found to affect retail rent after a lag of one quarter. This time lag is reasonable as it takes time for the reduced demand for local retail products to affect the demand for and rents of retail space. Moreover, it shows that landlords do not make reference to the current ΔDEPART in adjusting retail rents.

5.4 Implications of Findings

This study has investigated the impacts of nine demand-side variables (ΔGDP, ΔSALE, ΔMORT, ΔCPI, ΔINCOME, ΔUNEM, ΔHSI, ΔVISIT, ΔDEPART) and one supply-side variable (ΔNEW) on the average retail rent (ΔRENT). Among the nine demand-side variables, six of them are significant determinants of the retail rents in Hong Kong. On the other hand, the single supply-side variable is insignificant. Overall, the final six-variable specification with appropriate time lags has a high explanatory power for the average retail rent at the macroeconomic level.

Though the estimated equation has not been tested for its forecasting power of retail rents, this study can provide further insights into the dynamics of retail rents in

Hong Kong. They may give some hints to retail market practitioners such as developers, investors, landlords and retailers. They may make reference to the macroeconomic determinants identified in this study for assessing retail rents and making decisions, like financing, purchase or renting, disposition, expansion and renovation of retail property. The findings from the empirical results have the following five major implications.

Firstly, on the supply-side, the insignificance of the Supply of Retail Space variable (ΔNEW) implies that the supply of retail space in Hong Kong is inelastic in the short run. Therefore, the average retail rent is primarily demand-determined and it conforms to the findings from some previous studies. Landlords, retailers and investors should therefore consider a range of demand-side indicators when assessing retail rents and making retail investment or development decisions in Hong Kong.

Secondly, the GDP variable (ΔGDP) is insignificant in the retail rent determination. Although GDP is a widely accepted indicator of general economic conditions, it is not made known to most people in Hong Kong. This suggests that people are alert to those macro-economic indicators that are more frequently announced or other micro-economic factors that can be easily observed. They will then adjust their spending behaviors in the retail market accordingly.

Thirdly, in the final specification, all demand-side variables (except ΔDEPART)

are strongly influenced by the economic fundamentals. Their significance indicates that retail rents respond to the economy. Most importantly, it demonstrates the close relationship between the retail property market and the macroeconomy. It is consistent with the previous literature that suggests the close relationship between property and economy.[79] Market practitioners should therefore consider different macroeconomic indicators when making decisions in the retail property market.

Fourthly, the time shifts involved in $\Delta MORT_{t-5}$, ΔHSI_{t-2} and $\Delta DEPART_{t-1}$ strongly suggest the existence of frictional responses of retail rents to these significant demand-side variables. This is justified by the fact that all these macro-factors affect the demand for retail goods and services and only have indirect subsequent impacts on the demand for retail space and thus its rents.

Lastly, a closer examination of the results reveal that Mortgage Rate ($\Delta MORT_{t-5}$) and Unemployment ($\Delta UNEM_{t}$) cause relatively substantial changes in $\Delta RENT$. This implies that in assessing the average retail rent, market practitioners should place more emphasis on mortgage rate and unemployment rate. On the other hand, Inflation (ΔHSI_{t-2}) and Departure ($\Delta DEPART_{t-1}$) have much few impacts on the average retail rents and hence deserve less attention. In this way, better investment and planning decisions can be made in the dynamic retail rental market.

[79] The relationship between property and economy has been investigated in Section 2.2.1.

CHAPTER 6 CONCLUSION

Despite the importance of retail market in the local economy of Hong Kong, macroeconomic rent determination of retail property is under-researched, as compared with other property market sectors. On the other hand, much effort of the previous literature is devoted to the micro-level determination of retail rents. This is unfortunate since understanding of the macro-determinants of retail rents is important to both scholars and practitioners in the retail property market. In view of this, this study aims to investigate the major determinants of retail rents in Hong Kong at the macroeconomic level.

The theoretical background of property rent determination was reviewed in the beginning to establish fundamentals for this study. The subsequent analysis was modelled on the demand-supply interaction in the retail rental market. In light of the close interrelationship between retail property market and macroeconomy, macro-market variables reflecting broad trends of the economy and the local retail market were identified. Ten explanatory variables were incorporated into the retail rent model to capture both demand-side and supply-side influences on the average retail rent. All of them were examined in terms of their general relationships with retail rents as well as the economy. Their situations and trends in Hong Kong were

also reviewed. Quarterly data over the period 1992-2002 was analyzed using the OLS regression technique. The empirical analysis produced satisfactory results in identifying the major determinations of retail rents in Hong Kong. The direction and magnitude of impacts of these determinants on retail rents were also investigated and explained. Finally, several implications were concluded from the empirical findings.

Section 6.1 below is a brief summary of the findings and implications of this study. Limitations of this study are addressed in Section 6.2. Finally, suggestions for further research areas are given in Section 6.3, which marks the end of this study.

6.1 Summary of Findings and Implications

Nine demand-side variables and one supply-side variable were empirically tested for their significance in the retail rent determination in Hong Kong. The OLS regression technique with stepwise function was employed. The empirical results suggest that changes of GDP, Income, Visitors and Supply of New Retail Space are insignificant in explaining the retail rent fluctuations. After the removal of these insignificant variables, six demand-side variables remained in the final model specification. They include Retail Sales, Mortgage Rate, Inflation, Unemployment, Stock Market Performance and Departure. Overall, the final model has a high explanatory power for the retail rent changes over the period of investigation. The six remaining variables

are all very significant (even at the 0.01 level), and of correct signs except for Mortgage Rate. Changes in Retail Sales and Inflation (both contemporaneous), and Stock Market Performance (lagged 2 quarters) have positive impacts on the change in Retail Rent; while changes in Mortgage Rate (lagged 5 quarters), Unemployment Rate (contemporaneous) and Departure (lagged 1 quarter) have negative impacts.

The findings of this study give five major implications. Firstly, the insignificance of the supply-side variable suggests that the supply of retail space tends to be inelastic in the short run. The average retail rents in Hong Kong are primarily demand-determined. Secondly, people are more inclined to respond to the market factors, of which they have good knowledge. Thirdly, as most demand-side variables in the final model are economic indicators, their significance suggests that the retail property market and the economy are closely related. Fourthly, the lagged structures of some determinants imply the frictional responses of retail rents to some macro-market factors. Lastly, Mortgage Rate and Unemployment Rate have substantial negative impacts on retail rents. Hence, they deserve more attention of market practitioners in making decisions in the retail property market.

Subject to a number of limitations, it is hoped that this study can contribute to a better understanding of the major determinants of retail rents in Hong Kong from a macroeconomic perspective. It is also hoped to help various market practitioners in

making decisions in the local retail market.

6.2 Limitations of the Study

Since some of the explanatory variables cannot be measured directly, indirect proxies are used. The validity and reliability of the model therefore depends on the quality of these proxies. However, in this study, the proxy of the Income variable i.e. Index of Payroll Per Person may underestimate the true aggregate income because some people may fail to report all their earnings. Besides, the Visitor variable is only proxied by the number of incoming visitors. It does not take into account of the amount of money they spend and cannot provide a comprehensive measure of the total consumer expenditure and hence demand in the local retail market. Moreover, the Supply variable is only proxied by the New Completions of "Other Commercial Premises". It does not indicate the supply of retail space specifically and fails to address the effect of the supply of existing stock on retail rents. As a result, these proxies cannot give comprehensive measures for their corresponding variables and may affect the validity of the findings from the empirical results.

From the diagnostic tests of the final retail rent model, it is observed that multicollinearity may exist due to the high correlation between the Unemployment and Inflation variables. However, this problem cannot be solved and remain to be a

limitation of the final retail rent model.

6.3 Further Research Areas

This study has established a retail rent model and investigated the major macroeconomic determinants of retail rents using past data series in Hong Kong. This study can be further extended in two directions.

Further researches can be undertaken to investigate the dynamics of the retail property cycles. Since it is shown that property market and economy are closely interrelated, the retail property cycle can be examined to show how closely it is linked to the national macroeconomic movements. The lead-lag relationships between them can also be studied. The future movements of retail rents may also be projected. These may provide useful insights into the dynamics of the retail property market in Hong Kong.

Apart from determining the underlying effects of each macro-market variable, the retail rent model can also be used to forecast future average retail rents. However, its forecasting ability has not been tested in this study. It is believed to provide far reaching implications for market practitioners because predicting and forecasting retail rents are now seen as necessary and explicit processes to establish the prospects of the retail market, thereby assisting them in making decisions in the marketplace.

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